PROJECT MANUAL
WYNNE SCHOOL DISTRICT

800 E Jackson Ave.
Wynne, AR 72396

NEW SR HIGH SCHOOL

10.20.2024

Joshua N. Bellaire
Architect

ARCH 1010
676 Marshall Ave. STE 101
Memphis, TN 38103

REGISTERED ARCHITECT
JOSHUA N. BELLAIRE
License Number 912055
10/20/2024
STATE OF ARKANSAS

ARCH 1010 | POLK STANLEY WILCOX | E|D|G | CSA ENGINEERING
CHAD STEWART & ASSOCIATES, INC.

TABLE OF CONTENTS

DIVISION 0 - INTRODUCTORY INFORMATION, PROCUREMENT & CONTRACT REQUIREMENTS

00 01 01 COVER SHEET
00 01 10 TABLE OF CONTENTS
00 09 00 ENGINEERING INSPECTIONS AND OBSERVATIONS
00 10 02 EDANGERED SPECIES ACT COMPLIANCE
00 10 03 STORMWATER POLLUTION PREVENTION PLAN
00 10 04 ARKANSAS HISTORIC PRESERVATION PROGRAM REFERENCE
00 72 13 GENERAL CONDITIONS OF THE CONTRACT
00 73 16 SUPPLEMENTARY CONDITIONS OF THE CONTRACT
00 93 13 REQUEST FOR INFORMATION

DIVISION 1 - GENERAL REQUIREMENTS

01 10 00 SUMMARY
01 20 00 PRICE AND PAYMENT PROCEDURES
01 23 00 ALTERNATES
01 25 00 SUBSTITUTION PROCEDURES
01 29 00 PAYMENT PROCEDURES (DAVIS-BACON)
01 30 00 ADMINISTRATIVE REQUIREMENTS
01 30 10 WEATHER DELAYS
01 32 16 CONSTRUCTION PROGRESS SCHEDULE
01 32 33 PHOTOGRAPHIC DOCUMENTATION
01 35 53 SECURITY PROCEDURES
01 40 00 QUALITY REQUIREMENTS
01 50 00 TEMPORARY FACILITIES AND CONTROLS
01 51 00 TEMPORARY UTILITIES
01 56 39 TEMPORARY TREE AND PLANT PROTECTION
01 57 13 TEMPORARY EROSION AND SEDIMENT CONTROL
01 60 00 PRODUCT REQUIREMENTS
01 70 00 CONTRACT CLOSEOUT
01 71 00 EXECUTION REQUIREMENTS
01 72 00 PROJECT RECORD DOCUMENTS
01 72 50 PROJECT WARRANTIES, OPERATION AND MAINTENANCE DATA
01 75 00 CLEANING

DIVISION 2 - EXISTING CONDITIONS

02 32 00 GEOTECHNICAL INFORMATION
02 41 00 DEMOLITION
02 41 19 SELECTIVE DEMOLITION

DIVISION 3 - CONCRETE

03 35 43 POLISHED CONCRETE FINISHING
REFER TO DRAWINGS

DIVISION 4 - MASONRY

04 20 00	MASONRY
04 20 10	CMU
04 81 00	UNIT MASONRY ASSEMBLIES

DIVISION 5 - METALS

05 40 00	COLD FORMED METAL FRAMING
05 50 00	METAL FABRICATIONS
05 51 00	METAL STAIRS
05 52 13	PIPE AND TUBE RAILINGS
05 73 00	DECORATIVE METAL RAILINGS

DIVISION 6 - WOOD, PLASTICS AND COMPOSITES

06 10 00	ROUGH CARPENTRY
06 41 00	ARCHITECTURAL WOOD CASEWORK

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

07 13 26	SELF-ADHERING SHEET WATERPROOFING SYSTEMS
07 14 16	COLD FLUID-APPLIED WATERPROOFING
07 21 00	THERMAL INSULATION
07 21 19	FOAMED IN PLACE INSULATION
07 25 00	AIR BARRIERS
07 42 13	FORMED METAL WALL AND SOFFIT PANELS
07 42 64	METAL COMPOSITE MATERIAL WALL PANELS
07 43 00	ACM RAINSCREEN
07 52 50	MODIFIED BITUMEN SHEET ROOFING
07 54 19	PVC THERMOPLASTIC SINGLE-PLY ROOFING
07 55 00	TPO ROOFING
07 62 00	SHEET METAL FLASHING AND TRIM
07 71 13	MANUFACTURED ROOF SPECIALTIES
07 84 00	FIRESTOPPING
07 92 00	JOINT SEALANTS
07 95 13	EXPANSION JOINT COVER ASSEMBLIES

DIVISION 8 - OPENINGS

08 11 13	HOLLOW METAL DOORS AND FRAMES
08 14 16	FLUSH WOOD DOORS
08 31 00	ACCESS DOORS AND PANELS
08 33 23	OVERHEAD COILING DOORS
08 33 23	OVERHEAD COILING DOORS
08 35 00	OH DOORS
08 40 00	STOREFRONT
08 40 50	1600 SYSTEM 2 SSG
08 41 13	ALUMINUM FRAMED STOREFRONT
08 44 13	GLAZED ALUMINUM CURTAINWALL
08 56 53	SECURITY WINDOWS (TELLER SERVICE)
08 71 10	DOOR HARDWARE

08 80 00 GLAZING
08 88 53 SECURITY GLAZING
08 91 00 LOUVERS

DIVISION 9 - FINISHES

09 21 16 GYPSUM BOARD ASSEMBLIES
09 21 16.23 GYPSUM BOARD SHAFT WALL ASSEMBLIES
09 22 26.23 METAL SUSPENSION SYSTEMS
09 51 00 ACOUSTICAL CEILINGS
09 51 13 ACOUSTICAL PANEL CEILINGS
09 54 00 INTERGRATED CEILING ASSEMBLIES
09 65 00 RESILIENT FLOORING
09 65 19 RESILIENT TILE FLOORING
09 65 66 RESILIENT ATHLETIC FLOORING
09 68 13 TILE CARPETING
09 83 11 ACOUSTICAL WALL SYSTEMS
09 84 13 FOAM SOUND PANELS
09 90 00 PAINTING AND COATING
09 93 00 TILING

DIVISION 10 - SPECIALTIES

10 11 00 VISUAL DISPLAY BOARDS
10 14 19 DIMENSIONAL LETTER SIGNAGE
10 21 30 PLASTIC TOILET COMPARTMENTS
10 22 33 OPERABLE PARTITIONS
10 26 00 WALL AND DOOR PROTECTION
10 28 00 TOILET ROOM ACCESSORIES
10 44 00 FIRE PROTECTION SPECIALTIES
10 73 16 METAL CANOPIES
10 75 29 PLAZA-MOUNTED FLAGPOLES

DIVISION 11 - EQUIPMENT

11 40 00 FOOD SERVICE EQUIPMENT (REFER TO DRAWINGS)
11 53 13 LABORATORY FUME HOODS
11 60 00 WELDING CURTAINS
11 61 33 STAGE RIGGING AND CURTAIN SYSTEMS
11 61 53 STAGE LIGHTING FIXTURES AND PORTABLE EQUIPMENT
11 61 63 STAGE LIGHTING POWER AND CONTROL SYSTEM
11 66 23 GYMNASIUM EQUIPMENT

DIVISION 12 – FURNISHINGS

12 35 53 LABORATORY CASEWORK
12 36 00 SOLID SURFACE MATERIAL
12 61 00 FIXED AUDIENCE SEATING
12 62 00 PORTABLE AUDIENCE SEATING
12 63 13 STADIUM AND ARENA BENCH SEATING

DIVISION 13 – SPECIAL CONSTRUCTION

DIVISION 14 - CONVEYING SYSTEMS

14 21 23.16 MACHINE ROOM-LESS ELECTRIC TRACTION PASSENGER ELEVATORS

DIVISION 21 - FIRE SUPPRESSION

21 05 00 SMALL CAPACITY SPLIT SYSTEM AIR CONDITIONERS
21 05 23 COMMON WORK RESULTS FOR FIRE SUPPRESSION
21 05 48 GENERAL DUTY VALVES FOR WATER BASED FIRE SUPPRESSION PIPING
21 11 00 VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMEI
21 12 00 FACILITY FIRE SUPPRESSION WATER SERVICE PIPING
21 13 00 FIRE SUPPRESSION STANDPIPES
21 30 00 FIRE SUPPRESSION SPRINKLER SYSTEMS

DIVISION 22 - PLUMBING

22 05 13 FIRE PUMPS
22 05 17 COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT
22 05 29 SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING
22 05 48 HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT
22 07 19 VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT
22 10 05 PLUMBING PIPING INSULATION
22 10 06 PLUMBING PIPING
22 11 13 FACILITY WATER DISTRIBUTION PIPING
22 13 13 FACILITY SANITARY SEWERS
22 30 00 PLUMBING PIPING SPECIALTIES
22 40 00 PLUMBING EQUIPMENT

DIVISION 23 - HEATING, VENTILATION AND AIR-CONDITIONING

23 05 13 COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT
23 05 48 VIBRATION AND SEISMIC CONTROLS FOR HVAC
23 05 53 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT
23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC
23 07 13 DUCT INSULATION
23 09 13 INSTRUMENTATION AND CONTROL DEVICES FOR HVAC
23 23 00 REFRIGERANT PIPING
23 31 00 HVAC DUCTS AND CASINGS
23 33 00 AIR DUCT ACCESSORIES
23 36 00 AIR TERMINAL UNITS
23 37 00 AIR OUTLETS AND INLETS
23 38 13 COMMERCIAL KITCHEN HOODS
23 74 13 PACKAGED OUTDOOR CENTRAL STATION AIR HANDLING UNITS
23 74 16 PACKAGED ROOFTOP AIR CONDITIONING UNITS
23 81 26.13 SMALL CAPACITY SPLIT SYSTEM AIR CONDITIONERS

DIVISION 24 & 25 – NOT USED

DIVISION 26 - ELECTRICAL

26 05 19	LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
26 05 26	GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
26 05 29	HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
26 05 33.13	CONDUIT FOR ELECTRICAL SYSTEMS
26 05 33.16	BOXES FOR ELECTRICAL SYSTEMS
26 05 48	VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS
26 05 53	IDENTIFICATION FOR ELECTRICAL SYSTEMS
26 09 23	LIGHTING CONTROL DEVICES
26 09 24	LIGHTING CONTROLS LUTRON VIVE
26 21 00	LOW VOLTAGE ELECTRICAL SERVICE ENTRANCE
26 22 00	LOW VOLTAGE TRANSFORMERS
26 24 16.23	PANELBOARDS SCHNEIDER ELECTRIC SQUARE D I LINE QMB
26 24 16	PANELBOARDS
26 27 26	WIRING DEVICES
26 28 13	FUSES
26 28 16.13	ENCLOSED CIRCUIT BREAKERS
26 28 16.16	ENCLOSED SWITCHES
26 33 23	CENTRAL BATTERY EQUIPMENT
26 43 00	SURGE PROTECTIVE DEVICES
26 51 00	INTERIOR LIGHTING
26 56 00	EXTERIOR LIGHTING

DIVISION 27 - COMMUNICATIONS

27 05 34	PATHWAYS AND INFRASCTRUCTURE FOR AV SYSTEMS
27 41 15	PERFORMANCE AUDIO VISUAL SYSTEMS AND EQUIPMENT

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

28 10 00	ACCESS CONTROL
28 31 00	FIRE DETECTION AND ALARM

DIVISION 29 & 30 – NOT USED

DIVISION 31 - EARTHWORK

31 10 00	SITE CLEARING
31 20 00	EARTH MOVING
31 21 16	TRENCHING
31 23 19	DEWATERING
31 50 00	EXCAVATION SUPPORT AND PROTECTION

DIVISION 32 - EXTERIOR IMPROVEMENTS

32 05 23	CONCRETE FOR EXTERIOR IMPROVEMENTS
32 11 23	AGGREGATE BASE COURSE ASPHALT PAVING
32 12 16	ASPHALT PAVING
32 13 13	CONCRETE PAVING
32 13 73	CONCRETE PAVING JOINT SEALANTS UNIT PAVING
32 14 00	UNIT PAVING
32 14 43	POROUS UNIT PAVING

32 17 23 PAVEMENT MARKINGS
32 18 13 SYNTHETIC GRASS SURFACING
32 31 13 CHAIN-LINK FENCE AND GATES
32 84 00 LANDSCAPE IRRIGATION PERFORMANCE SPECIFICATION
32 91 13 SOIL PREPARATION
32 92 00 TURF AND GRASSES
32 93 00 PLANTS
32 94 00 HYDROSEEDING

DIVISION 33 - UTILITIES

33 05 00 COMMON WORK RESULTS FOR UTILITIES
33 05 13 MANHOLES AND STRUCTURES
33 41 11 STORM DRAINAGE

DIVISION 34-48 – NOT USED

END OF DOCUMENT

SECTION 000900

ENGINEERING INSPECTIONS AND OBSERVATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Engage and provide a qualified Engineering Inspections and Observations firm to provide Owner and Engineer of Record daily Inspections and Observations and reports in addition to other inspections and observations required in other Specification Sections for the project. Frequency of Inspections and Observations shall be on an as-needed basis.

1. At a minimum the Inspections and Observations Engineer shall witness materials sampling and testing, City Inspections requiring an Owner Representative, and monthly Progress meetings.
2. Engineer of record may be retained at their standard hourly billing rate.
3. A third-party Engineer licensed in the State of Arkansas may be retained to provide the required daily Inspections and Observations.

B. Inspections and Observations Engineer shall report directly to the project Engineer of Record and the Owner.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 001002

ENDANGERED SPECIES ACT COMPLIANCE

PART 1 - GENERAL

1.1 SUMMARY

A. Contractor shall comply with all requirements and recommendations of the United States Endangered Species Act and Gold and Bald Eagle Protection Act. All construction activity shall comply with the recommendations and requirements of the US Fish and Wildlife Service for the protection of endangered species. The following documents and codes are hereby incorporated by reference to these Project Specifications.

1. Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 et seq.)
2. Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d)

B. There are NOT known endangered species, or Bald or Golden Eagles present at or near the proposed work areas.

C. If endangered species or Bald or Golden Eagles are encountered during construction the Contractor shall stop work immediately and notify the Owner and Engineer. Contractor shall await direction prior to commencing work activities.

D. Contractor shall conduct a tree removal pre-construction conference to review the trees to be removed.

E. Contractor shall obtain written approval form the City, Owner, and Engineer prior to any burning of trees or brush onsite.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 001003

STORMWATER POLLUTION PREVENTION PLAN

PART 1 - GENERAL

1.1 SUMMARY

A. Contractor shall comply with all requirements and recommendations of the Arkansas Department of Energy and Environment (ADEE) Construction Stormwater Discharge Permit. The following documents and codes are hereby incorporated by reference to these Project Specifications.

1. Stormwater Pollution Prevention Plan (SWPPP) for Construction Activities for Large Construction Sites.
2. ADEQ SWPPP General Permit No. ARR150000 Large Site

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 001004

ARKANSAS HISTORIC PRESERVATION PROGRAM REFERENCE

PART 1 - GENERAL

1.1 SUMMARY

A. Contractor shall comply with all requirements and recommendations of the Arkansas Department of Heritage, Arkansas Historic Preservation Program and National Historic Preservation Act. The following documents and codes are hereby incorporated by reference to these Project Specifications.

1. National Historic Preservation Act of 1966 (NHPA, Public Law 89-665; 54 U.S.C. 300101 et seq.)

B. There are NOT known historic properties or cultural resources at or near the proposed work areas.

C. If cultural resources or historic properties are encountered during construction the Contractor shall stop work immediately and notify the Owner and Engineer. Contractor shall await direction prior to commencing work activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 00 72 13

GENERAL CONDITIONS OF THE CONTRACT

1. PART 1 GENERAL

A. The “General Conditions of the Contract for Construction”, AIA Document A201, latest edition, is hereby made a part of the Contract Specifications as if herein written out in full. This document is on file and may be examined in the Architect’s Office, or copies may be obtained from the American Institute of Architects – 1735 New York Avenue, N.W., Washington, DC 20006

B. Certain Articles of the above-named General Conditions may be altered, supplemented or modified as set forth in the following “Supplementary General Conditions”. Where such articles or parts are so revised, the remaining Articles and parts not revised remain in full force and effect.

END OF SECTION 00 72 13

SECTION 00 73 16

SUPPLEMENTARY CONDITIONS OF THE CONTRACT

PART 1 GENERAL

These Supplementary General Conditions of the Contract are hereby made a part of each heading of the hereinafter included specifications as if bound, included and /or repeated therein. Should any of the following articles be in conflict with articles contained in the foregoing printed General Conditions of the Contract, the printed General Conditions of the Contract shall govern.

Refer to Article 3.21 of the General Conditions. Contrary to the first sentence of this Article, the Owner will not be obligated to furnish surveys of any nature other than those previously furnished to the Architect.

Refer to Article 11, "Contractors Liability Insurance": of the General Conditions. The limits of Liability referred to in this Article are hereby established as the following amounts:

General Liability – Bodily Injury – Each Occurrence.	$1,000,000
-Bodily Injury-Aggregate……....	2,000,000
-Property Damage-Each Occurrence..	500,000
-Property Damage-Aggregate…….	1,000,000
-Personal Injury-Aggregate…….	500,000
Owners and Contractors Protective Liability	
-Each Occurrence Limit…….	$500,000
-Aggregate Limit ……...	500,000
Automobile Insurance - Bodily Injury - Per Person-Single Limit …	$1,000,000
Workmen's Compensations as required by law.	
Employer's Liability-Each Accident…….	$ 100,000
-Disease Per Employee……...	100,000
-Disease (Policy Limit)……...	500,000
Umbrella……	1,000,000

Property Insurance (Builders Risk)-To be provided by the Owner.
The certificates presented shall show, as additional insured, both the Owner and the Architect. General Contractor shall submit, to the Architect, in triplicate, certificates showing that all required insurance is in force before starting the construction.

Refer to Article 11.2 "Owner's Liability Insurance" of the General Conditions: The General Contractor shall maintain in force during the life of the Contract, Owner's Contingent Liability Insurance which shall extend to protect the Owner's Architect from any liability that might arise from operations under this Contract.

Refer to Article 7.5 "Guaranty Bond" of the General Conditions: Any bidder to whom a contract is awarded will be required to furnish a public contractor's Performance Bond and Labor and Materials Payment Bond to be issued by a surety company licensed to do business in the State of Tennessee, and subject to the approval of the Owner; for a sum equal to 100% of the Contract Sum. Cost of paid bonds shall be included in each bid and shall be paid for by the Contractor.

The General Contractor shall be responsible for the distribution of Construction Documents to all of his Subcontractors and material suppliers, and all documents used for the purpose of fulfilling the contract.

The General Contractor shall at all times during the progress of the work remove and keep the building free of all rubbish. The General Contractor shall also make repairs to any damaged work before tendering the building for acceptance. All Sub-Contractors, while on site, shall provide the General Contractor one (1) laborer for the sole purpose of clean-up on a daily basis.

The General Contractor shall provide all barriers and other necessary safeguard for the protection of the public.

Any material specified by reference to the number, symbol, or title of specific standard, such as is a Commercial Standard, a Federal Specification, a Trade Association Standard, or other similar standard shall comply with the requirements.

In the latest revision thereof and any amendment or supplement thereto in effect on the date of the Invitation for Bids, except as limited to type, class or grade or modified in such reference.

The Standards referred to, except as modified in the Specifications, shall have full force and effect as though printed in the specification. These standards are not furnished to bidders for the reason that the manufacturers and trades involved are assumed to be familiar with their requirements. The Architect will furnish, upon request, information as to how copies of the standards referred to may be obtained.

Reference in the specifications to any article, device, product, material, fixture form or type of construction by name, make or catalog number shall be interpreted as establishing a standard to quality and shall not be construed as limiting competition: and the Contractor in such cases, may at this option use any article, device, product, material, fixture, form or type of construction which in the judgment of the Architect expressed in writing is equal to that specified.

Laboratory Tests: Any specified laboratory tests of material and finished articles to be incorporated in the work shall be made by bureaus, laboratories or agencies approved by the Architect, and the reports of such tests shall be submitted to the Architect. The cost of the testing shall be paid for by the Contractor or Owner as may be stated in the Specifications. The Contractor shall furnish all sample materials required for these tests and shall deliver same without charge to the testing laboratory or other designated agency when and where directed by them.

Taxes: The Contractor shall, without additional expense to the Owner, pay all applicable Federal, State and Local sales and other taxes, except taxes and assessments on the real property comprising the size of the project.

Guarantee of Work: Except as otherwise specified, all work shall be guaranteed by the Contractor against defects arising from the use of inferior materials, equipment, or workmanship for one year from date of final completion of the Contract. If within any guarantee period, repairs or changes are required in connection with guaranteed work, which, in the opinion of the Architect is rendered necessary as the result of the use of materials, equipment, or workmanship which are inferior, defective or not in accordance with the terms of the Contract, or from omissions or work specifically required by the Plans and/or Specifications, the Contractor shall, promptly upon receipt of notice from the Owner, and without expense to the Owner:

Place in satisfactory condition in every particular all of such guaranteed work, correct all defect therein and make good all damages to the building or site, or equipment or content thereof which in the opinion of the Architect, is the result of the use of material, equipment, or workmanship which are inferior, defective, or not in accordance with the terms of the contract, and make good any work or material, or the equipment and contents of said building or site disturbed in fulfilling any such guarantee.

In any case wherein fulfilling the requirements of the contract or any guaranteed work, embraced in or required, thereby, the Contractor disturbs any work guaranteed under another contract, he shall restore such disturbed work to a condition satisfactory to the Architect and guarantee such restored work to the same extent as it was guaranteed under such other contract. If the Contractor, after notice, fails to proceed promptly to comply with the terms of the guarantee, the Owner may have the defects corrected and the Contractor and his surety shall be liable for all expenses incurred.

All Special guarantees applicable to definite parts of the work that may be stipulated in the specifications or other papers forming a part during the first year of life of such guarantee.

Accident Prevention: Precaution shall be exercised at all times for the protection of persons and property. The safety of applicable laws, building and construction codes shall be observed. Machinery, equipment, and other hazards shall be guarded in accordance with the safety provisions of the Manual of Accident Prevention in Construction, published by the Association of General Contractors of America to the extent that such provisions are not the contravention of applicable law.

Quality of Materials and Workmanship: Unless a lower grade is specifically defined and called for in this Contract, all materials, equipment and appliances furnished by the Contractor shall be new and the best quality as measured by the highest standard of the trade, any defects in the materials, equipment or appliances that would cause its rejection in strictly a First Class work will cause rejection.

It is the intent of these Specifications to provide that the Contractor shall furnish all labor and materials (excepting these items here specifically exempt) requisite and necessary for the full completion of the work or that portion of the work for which his proposal is accepted. All items necessary for such full completion are to be furnished by the Contractor, whether specifically mentioned herein or not.

Measurements: Before ordering any material or doing any work, each contractor shall verify all measurements of the building and shall be responsible for the correctness of same. No extra charge or compensation will be allowed in account of difference between actual dimensions and the measurements indicated on the Drawings.

Protecting Site and Building: Provide and maintain suitable coverings in all openings of windows, and padlock temporary doors at all, not other-wise, enclosed openings as soon as roof is on and provide and maintain suitable covering for all work liable to damage from any cause during the progress of the construction.

The Contractor shall be responsible for any unnecessary or unwarranted damage done to the building throughout the progress of the work. He will also be responsible for damage to any other features of the site.

Temporary Work and Scaffolding: The Contractor must provide all necessary temporary work and scaffolding, maintaining same at all times, in strong safe condition.

Sanitary Conveniences: During the construction of the building, the Contractor shall provide proper sanitary conveniences for workmen. They shall be kept in a thoroughly sanitary condition at all times and adequately supplied with good grade of toilet paper.

Storage and Care of Materials: The Contractor shall so store, pile and arrange materials that they will not be damaged by the elements, by the processes of construction, by contact with ground or from other causes. He shall provide any and all protective coverings necessary for this purpose designated by the manufacturer or supplier of the material.

END OF SECTION 00 73 16

SECTION 00 9313

REQUESTS FOR INFORMATION

PART 1 GENERAL

1.01 SUMMARY

A. Requirements which govern the use of “Request for Information Form”.

1.02 REQUIREMENTS

A. Requests For Information (RFI) shall be submitted in accordance with the requirements of 01 3000 Administrative Requirements, paragraph 3.01 Electronic Document Submittal Service.

B. All Requests For Information shall be submitted by the General Contractor.
   1. RFI’s directly from subcontractors are not acceptable.
   2. RFI’s shall be submitted on AIA Form G716-2004 or a form acceptable to the Architect which contains all the information as described in paragraph 1.03.

C. RFI’s shall be numbered consecutively by the Contractor as submitted.

D. Submittal of an RFI constitutes representation that the Contractor requires additional information about the Contract Documents AFTER he has made careful study and comparison of the Contract Documents, field conditions, other Owner-provided information, Contractor-prepared coordination drawings, or prior project correspondence or documentation.

E. If, upon evaluation of the RFI, the Architect finds that the requested information is contained in the Contract Documents or by other documents and/or methods as outlined in Paragraph “D”, the Owner has the option to obtain reimbursement from the Contractor for costs incurred by the Owner for the Architect’s services and expenses made necessary in answering such requests.

F. A reply to a Request For Information is not an authorization to proceed with work involving additional cost, time or both. If any reply requires a change to the Contract Documents, a Change Order or a Construction Change Directive must be executed in accordance with the Contract Documents.

1.03 REQUESTS FOR INFORMATION

A. Each Request For Information Form shall be complete with data indicating the specific drawing(s) or specification(s) in need of clarification including the following:
   1. RFI number.
   2. Date submitted.
   3. Subject requiring clarification.
   4. Discipline (Architectural, Structural, Mechanical, Electrical, etc.).
   5. Co-author, or subcontractor if applicable.
   6. Detailed statement of the information requested along with any and all references or attachments.
   7. Date information required.

B. Requests For Information shall be made in a timely manner allowing the Architect a reasonable amount of time to review the request.
   1. If the date a response is required is not indicated, the assumed date the response is required shall be 15 working days from the date the Architect received the request.
   2. Processing of received RFI’s will be from Monday to Thursday, 9am to 5pm. Any RFI’s received on a Friday will be processed the following Monday.

C. Sender's Recommendation: All Requests for Information must provide a recommended solution, including cost and/or schedule considerations. An RFI submitted to the Architect without the Sender's Recommendation will not have standing, will be returned to the Sender unanswered, and logged as closed.

D. Receiver's Reply: Provide space on the form for the receiver (Architect) to write the reply on the face of the form.

E. Tracking: The contractor will maintain a log of RFI's submitted, in order, containing the information listed in paragraph 1.03 A.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01 1000

SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: New High School Building

B. Owner's Name: Wynne Public Schools

C. Architect's Name: Joshua Bellaire.

D. The Project consists of construction of the Work as follows:
   1. Construction of a New High School Building.

E. Square Footage Per Floor: Reference Life Safety Plan drawings for square footage.

F. Work Sequence: Construct Work in stages to maintain existing pedestrian access around the site and to maintain vehicular access to parking lots and drives. Maintain emergency egress from the existing building through the construction area as required.

G. Do not allow any utility outages to existing facilities without prior written approval of the Owner.

I. Other work as indicated.

1.02 CONTRACT DESCRIPTION

A. Construction Management.

1.03 SCHEDULE

A. See Section 00 7000 General and Supplemental Conditions.

B. As an additional condition for substantial completion, all final governmental inspections and occupancy approvals shall be obtained.

C. Refer to the current project schedule from the Construction Manager. Coordinate as required for stipulated dates for deliveries, installation and completion for the Work of all trades.

1.04 WORK OF THIS CONTRACT DOCUMENTED BY OTHER DESIGNERS:

A. None at this time.

1.05 OWNER OCCUPANCY

A. The owner will maintain access to the site.

1.06 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings.

B. No Contractor and/or Subcontractor on any operation on this project, may enter upon, use or in any way encumber the legal use of adjacent property by the Owners or legal tenants or cause unreasonable inconvenience to their use thereof without the written consent of such Owner or tenant delivered through the Owner.

C. Access to and security of the existing buildings must be maintained during the extent of this Contract. Job conditions in coordination with Owner and Architect will determine the exact access routes, however, this Contractor and all Subcontractors are advised that all necessary precautions must be taken to prevent interference with the Owner's operation and security requirements. Contractor shall coordinate all work in this Contract which affects the Owner's operation and security requirements with the Owner.

D. Contractor and all Subcontractors shall use and maintain in clean condition, site access roads and/or routes as designated by the Owner. No other access shall be used for materials, vehicles or men.

E. Contractors, subcontractors and workmen shall not trespass into existing finished and completed areas of the building without permission of the Owner.

F. Confine operations at site to areas permitted by:
   1. Law
   2. Ordinances
   3. Permits
   4. Contract Documents with Contract "Work Limits"

G. Do not unreasonably encumber site with materials or equipment. Contractor shall limit his use of the premises for his Subcontractors, work and for storage per Section 01500, to allow for:
   1. Work By Other Contractors and/or Subcontractors
   2. Owner Occupancy
   3. Public Use

H. Do not load structure with weight that will endanger structure(s).

I. Assume full responsibility for protection and safekeeping of products stored on premises.

J. Move any stored products under Contractor's and/or Subcontractors' control which interfere with the operations of the Owner as, if and when instructed by the Owner.

K. Provide access to and from site as required by law and by Owner:
   1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered. If exit access must be routed through a construction area, provide barricaded, protected access through the construction area.
   2. Do not obstruct roadways, sidewalks, or other public ways without permit. Maintain existing vehicular driveways on the site.

M. Utility Outages and Shutdown:
   1. Do not disrupt or shut down utility services and/or life safety systems without prior written approval of the Owner and authorities having jurisdiction. Coordinate time and duration of disruption or shut down with the Owner.
   2. Prevent accidental disruption of utility services to other facilities.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2000

PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Documentation of changes in Contract Sum and Contract Time.

C. Change procedures.

D. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

A. Section 00 7000 - General and Supplementary Conditions: Owner – Design-Build Agreement, contract price, retainage, and payment periods.

B. Section 00 7000 - General and Supplementary Conditions: Additional requirements for progress payments, final payment, changes in the Work, percentage allowance of Contractor's overhead and profit.

C. Section 01 2100 – Allowances.

1.03 SCHEDULE OF VALUES

A. Form to be used: AIA Application and Certificate for Payment Continuation Sheet.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.

C. Forms filled out by hand will not be accepted.

D. Submit three (3) copies of Schedule of Values within 15 days after date established in Notice to Proceed. Architect will review with Owner for agreement and return one (1) copy to the Contractor and transmit one (1) copy to the Owner.

E. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification Section. Identify site mobilization and demobilization.

F. Schedule of Value for each trade or operation shall have an identifiable relationship with the Construction Progress Schedule.

G. Schedule shall list the installed value of the component parts of the Work in sufficient detail to serve as a basis for computing values for Applications for Progress Payments (Article 1.04) during construction. Round off dollar values to nearest dollar.

H. For items on which progress payments will be requested for stored materials, break down the value into:
   1. The cost of materials delivered and unloaded.
   2. The total installed value.

I. Include as a separate line item, the amount of each allowance specified in Section 01 2100 - Allowances and/or indicated on the contract drawings.

J. Revise Schedule of Values to list approved change orders, with each Application for Payment.

K. The sum of all values listed in the schedule shall equal the Contractor's total Contract Sum.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Owner – Contractor Agreement.

B. Form to be used: AIA Owner – Contractor Agreement for a Stipulated Sum.

C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.

D. Forms filled out by hand will not be accepted.

E. For each item, provide a column for listing each of the following:
   1. Item Number.
   2. Description of Work.
   3. Schedule of Values.
   4. Work Completed from Previous Applications.
   5. Work Completed under this Application.
   6. Prior and Current Materials Stored and Used.
   7. Total Completed and Stored to Date.
   8. Percentage of Completion.
   9. Balance to Finish.
   10. Retainage.

F. Execute certification by signature of authorized officer.

G. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.

H. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of Work.

I. Submit three copies of each Application for Payment.

J. Include the following with the application:
   1. Transmittal letter as specified for Submittals in Section 01 3000.
   2. Construction progress schedule, revised and current as specified in Section 01 3216.
   4. When requested project record documents as specified in Section 01 7200, for review by Owner which will be returned to the Contractor.
   5. Affidavits attesting to off-site stored products.

K. Substantiating Data for Progress Payments
   1. The General Contractor, beginning with the second Application for Payment, shall verify that he has paid all Subcontractors and major material suppliers those respective amounts representing all Work and material which have formed the basis of previous progress payments.
   2. Submit suitable information with a cover letter identifying:
      a. Project name.
      b. Application number and date.
      c. Detailed list of enclosures.
      d. For stored products or materials:
         1) Item number and identification as shown on application.
         2) Description of specified material and its stored location with appropriate insurance data, etc.
   3. Submit one copy of data and cover letter for each copy of application.

L. When Architect requires substantiating information, submit data justifying dollar amounts in question.

M. Upon review and approval of Application for Payment, Architect will transmit two (2) copies to the Owner for payment with copy of cover letter to the General Contractor.

1.05 MODIFICATION PROCEDURES

A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect

will issue instructions directly to Contractor.

B. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
   1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
   2. Promptly execute the change.

C. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 14 calendar days.

D. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors. Document any requested substitutions in accordance with Section 01 6000.

E. Computation of Change in Contract Amount: As specified in the Owner – Design Builder Agreement and General and Supplementary Conditions of the Contract.
   1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
   2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.
   3. For allowances the cost will be based on Contractor’s price quotation.

F. Substantiation of Costs: Provide full information required for evaluation.
   1. Provide following data:
      a. Delivery, unloading and storage costs.
      b. Quantities of products, labor, and equipment.
      c. Taxes, insurance, and bonds.
      d. Overhead, profit and fees.
      e. Justification for any change in Contract Time.
      f. Credit for deletions from Contract, similarly documented including costs indicated above.
   2. Support each claim for additional costs with additional information:
      a. Origin and date of claim.
      b. Dates and times work was performed, and by whom.
      c. Time records and wage rates paid.
      d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.

G. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

H. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

I. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change and resubmit.

J. Promptly enter changes in Project Record Documents.

K. Retain one (1) copy with backup information at the project site.

1.06 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:
   1. All closeout procedures specified in Section 01 7000.

C. Refer to Section 01700 for requirements for Application for Final Payment.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 23 00
DEDUCTIVE ALTERNATES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

A. This section includes administrative and procedural requirements governing alternates to the base bid.

B. Alternate pricing will be required for specific work that may be added to or deducted from the base bid amount if the Owner accepts the corresponding change.

C. Each alternate bid is to include all costs necessary to accomplish the work in accordance with these contract documents, including equipment, materials, tax, labor, overhead, profit, insurance, supervision, shipping and freight, storage and protection, close out documentation, warranty, and any other incidental costs necessary to complete the work.

D. The cost or credit for each alternate is the net adjustment to the Contract Sum to incorporate the work of the alternate into the Contract. No other adjustments are made to the Contract Sum.

E. Alternates described in this section are to be incorporated into the Work only if accepted by the Owner and included in the Contract Sum.

1.3 PROCESS

A. The bidders are required to enter an amount for each alternate on the Bid Proposal Form. Failure to enter alternate pricing may result in disqualification of the bid.

B. Alternate pricing will be used by the Owner to evaluate the bids. Any combination of alternates and base bid may be used to establish the winning bid.

C. Parties may agree to defer consideration of the alternate bids for later incorporation into the Contract by Change Order.

Upon acceptance of a deferred alternate, the Contractor is to update the project schedule and schedule of values to accurately reflect the added or deleted work.

1.4 SUBMITTALS

A. Provide shop drawings, product data, samples and other submittals as required for alternate work in the same manner as other work performed under this contract.

PART 2 – PRODUCTS (not used)

PART 3 – EXECUTION

3.1 REQUIREMENTS

A. Requirements for work performed under alternate pricing are identical to the requirements for work performed under the base scope of the Project, as specified elsewhere in these documents.

B. Coordinate materials and their installation with related materials and installations to ensure that the work of the alternate is completely integrated and interfaced with related work.

C. Record the alternate work on the red-marked field drawings, for incorporation into the final record documents.

SCHEDULE OF ALTERNATES

Deductive Alternate No. 01:
Substitute Scored Concrete with Integral color for Permeable Pavers and Ribbon Curb at all locations indicated on Civil drawings. See related Civil specifications for all materials and execution requirements.

Deductive Alternate No. 03:
Tennis Courts. Omit Two (2) of the Four (4) Tennis Courts from the project and all associated Concrete Sidewalks, Fencing, Broken Concrete Pavement, and Drainage Infrastructure at locations indicated on Civil drawings. See related Civil specification sections for all materials, fastener types, preparation, painting and execution requirements, etc.

Deductive Alternate No. 05:
Roofing System. Replace Specified areas of 80 mil Fully-Adhered Roofing System with 60 mil Mechanically Attached Roofing System at all TPO locations indicated on Architectural Drawings. See related specification sections for all materials, fastener types, preparation, and execution requirements, etc.
Note: Gymnasium/Storm Shelter Roof Area must remain Fully-Adhered and Mechanically Fastened PVC Roof System is to remain at locations indicated on Architectural Drawings.

Deductive Alternate No. 06:
Brick. Replace all Specified Modular Sized Brick with Utility Sized Brick at all locations indicated to receive Brick in the entire project. Reference Architectural drawings for locations. See related specification sections for all materials, seismic ties, flashing, preparation, and execution requirements, etc. – Basis of Design shall be #938 Light Gray (Wire Cut) Modular by ‘Bowerston’ – Or Approved Equal.

Deductive Alternate No. 07:
Auditorium Balcony. Omit the entire Balcony and all Elements associated with Balcony at Auditorium Second Floor including but not limited to Balcony Structure and Framing, Low Walls, Stairs, Floor Finish, Guardrails & Handrails, and Seating as indicated on Architectural drawings. See related specification sections for all materials, fastener types, preparation, and execution requirements, etc.

Deductive Alternate No. 08:
Courtyard Stairs. Omit the entire Courtyard Stair and all Elements associated with Stair in the Courtyard including but not limited to Stair Structure and Framing, Footings, Floor Drains, Walls, Doors, Louvers,

Guardrails & Handrails, Electrical Fixtures, and Seating as indicated on Architectural drawings. See related specification sections for all materials, fastener types, preparation, and execution requirements, etc.

Deductive Alternate No. 09:
Vinyl Wall Graphics. Omit all Vinyl Wall Graphics in Entire Project that are indicated on Architectural drawings and are to be included in the Base Bid. See related specification sections for all materials, fastener types, preparation, and execution requirements, etc.

Deductive Alternate No. 10:
Woodworks ACT. Change all areas of specified Woodworks ACT to Calla ACT System in all locations indicated to be Woodworks ACT in the entire Project. See related specification sections for all materials, fastener types, preparation, and execution requirements, etc.

Deductive Alternate No. 11:
Cafeteria Dining Ceiling. Change the Entire Cafeteria Dining Ceiling and Lighting Design to match the Media Center Ceiling and Lighting Design (Calla ACT System). See related specification sections for all materials, fastener types, preparation, and execution requirements, etc.

END OF SECTION

SECTION 01 25 00

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Document 002600 "Procurement Substitution Procedures" for requirements for substitution requests prior to award of Contract.
2. Section 012100 "Allowances" for products selected under an allowance.
3. Section 012300 "Alternates" for products selected under an alternate.
4. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.2 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required to meet other Project requirements but may offer advantage to Contractor or Owner.

1.3 ACTION SUBMITTALS

A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use form that is part of web-based Project management software and acceptable to Architect.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size,

durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from **ICC**.
j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven (7) days of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.4 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.5 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.6 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for

change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

    a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    b. Requested substitution provides sustainable design characteristics that specified product provided for compliance with LEED requirements.
    c. Requested substitution provides sustainable design characteristics that specified product provided for compliance with IgCC requirements.
    d. Requested substitution provides sustainable design characteristics that specified product provided for compliance with ASHRAE 189.1 requirements.
    e. Requested substitution provides sustainable design characteristics that specified product provided for compliance with Green Globes requirements.
    f. Substitution request is fully documented and properly submitted.
    g. Requested substitution will not adversely affect Contractor's construction schedule.
    h. Requested substitution has received necessary approvals of authorities having jurisdiction.
    i. Requested substitution is compatible with other portions of the Work.
    j. Requested substitution has been coordinated with other portions of the Work.
    k. Requested substitution provides specified warranty.
    l. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience:

1. Not allowed unless otherwise indicated.
2. Architect will consider requests for substitution if received within **60** days after commencement of the Work. Requests received after that time may be considered or rejected at discretion of Architect.

    a. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

        1) Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
        2) Requested substitution does not require extensive revisions to the Contract Documents.
        3) Requested substitution is consistent with the Contract Documents and will produce indicated results.
        4) Requested substitution provides sustainable design characteristics that specified product provided for compliance with LEED requirements.
        5) Requested substitution provides sustainable design characteristics that specified product provided for compliance with IgCC requirements.
        6) Requested substitution provides sustainable design characteristics that specified product provided for compliance with ASHRAE 189.1

requirements.

7) Requested substitution provides sustainable design characteristics that specified product provided for compliance with Green Globes requirements.
8) Substitution request is fully documented and properly submitted.
9) Requested substitution will not adversely affect Contractor's construction schedule.
10) Requested substitution has received necessary approvals of authorities having jurisdiction.
11) Requested substitution is compatible with other portions of the Work.
12) Requested substitution has been coordinated with other portions of the Work.
13) Requested substitution provides specified warranty.
14) If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 29 00

PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:

1. Document 004373 "Proposed Schedule of Values Form" for requirements for furnishing proposed schedule of values with bid.
2. Section 012100 "Allowances" for procedural requirements governing the handling and processing of allowances.
3. Section 012200 "Unit Prices" for administrative requirements governing the use of unit prices.
4. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
5. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.
6. Section 018113.13 "Sustainable Design Requirements - LEED 2009 for New Construction and Major Renovations" for administrative requirements governing submittal of cost breakdown information required for sustainable design documentation.
7. Section 018113.16 "Sustainable Design Requirements - LEED 2009 for Commercial Interiors" for administrative requirements governing submittal of cost breakdown information required for sustainable design documentation.
8. Section 018113.19 "Sustainable Design Requirements - LEED 2009 for Core and Shell Development" for administrative requirements governing submittal of cost breakdown information required for sustainable design documentation.
9. Section 018113.23 "Sustainable Design Requirements - LEED 2009 for Schools" for administrative requirements governing submittal of cost breakdown information required for sustainable design documentation.
10. Section 018113.14 "Sustainable Design Requirements - LEED v4 BD+C" for administrative requirements governing submittal of cost breakdown information required for sustainable design documentation.
11. Section 018113.17 "Sustainable Design Requirements - LEED v4 ID+C" for administrative requirements governing submittal of cost breakdown information required for sustainable design documentation.
12. Section 018113.43 "Sustainable Design Requirements - ASHRAE 189.1" for administrative requirements governing submittal of cost breakdown information required for sustainable design documentation.
13. Section 018113.53 "Sustainable Design Requirements - Green Globes" for administrative requirements governing submittal of cost breakdown information required for sustainable design documentation.

1.2 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.3 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule. Cost-loaded Critical Path Method Schedule may serve to satisfy requirements for the schedule of values.

1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
2. Submit the schedule of values to Architect through Construction Manager at earliest possible date, but no later than seven (7) days before the date scheduled for submittal of initial Applications for Payment.
3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.
4. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.
5. Subschedules for Separate Design Contracts: Where the Owner has retained design professionals under separate contracts who will each provide certification of payment requests, provide subschedules showing values coordinated with the scope of each design services contract, as described in Section 011000 "Summary."

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:

a. Project name and location.
b. Owner's name.
c. Owner's Project number.
d. Name of Architect.
e. Architect's Project number.
f. Contractor's name and address.
g. Date of submittal.

2. Arrange schedule of values consistent with format of AIA Document G703.
3. Arrange the schedule of values in tabular form, with separate columns to indicate the following for each item listed:

a. Related Specification Section or division.
b. Description of the Work.
c. Name of subcontractor.
d. Name of manufacturer or fabricator.
e. Name of supplier.
f. Change Orders (numbers) that affect value.
g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-

hundredth percent, adjusted to total 100 percent. Round dollar amounts to whole dollars, with total equal to Contract Sum.

1) Labor.
2) Materials.
3) Equipment.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five (5) percent of the Contract Sum.
5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

   a. Differentiate between items stored on-site and items stored off-site.

6. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
7. Purchase Contracts: Provide a separate line item in the schedule of values for each Purchase contract. Show line-item value of Purchase contract. Indicate Owner payments or deposits, if any, and balance to be paid by Contractor.
8. Overhead Costs, Proportional Distribution: Include total cost and proportionate share of general overhead and profit for each line item.
9. Overhead Costs, Separate Line Items: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
10. Temporary Facilities: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
11. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling [**five**]<**Insert number**> percent of the Contract Sum and subcontract amount.
12. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments, as certified by Architect and paid for by Owner.

B. Payment Application Times: The date for each progress payment is indicated in the Owner/Contractor Agreement. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Times: Submit Application for Payment to Architect by the 25th of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.

   1. Submit draft copy of Application for Payment seven (7) days prior to due date for review by Architect.

D. Application for Payment Forms: Use **AIA Document G702 and AIA Document G703** as form for Applications for Payment.

1. Other Application for Payment forms proposed by the Contractor may be acceptable to Architect and Owner. Submit forms for approval with initial submittal of schedule of values.

E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
3. Provide summary documentation for stored materials indicating the following:

    a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

G. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.

3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
5. Products list (preliminary if not final).
6. Sustainable design action plans, including preliminary project materials cost data.
7. Schedule of unit prices.
8. Submittal schedule (preliminary if not final).
9. List of Contractor's staff assignments.
10. List of Contractor's principal consultants.
11. Copies of building permits.
12. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
13. Initial progress report.
14. Report of preconstruction conference.
15. Certificates of insurance and insurance policies.
16. Performance and payment bonds.
17. Data needed to acquire Owner's insurance.

J. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

    a. Complete administrative actions, submittals, and Work preceding this application, as described in Section 017700 "Closeout Procedures."

2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

K. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Certification of completion of final punch list items.
3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
4. Updated final statement, accounting for final changes to the Contract Sum.
5. AIA Document G706.

6. AIA Document G706A.
7. AIA Document G707.
8. Evidence that claims have been settled.
9. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
10. Final liquidated damages settlement statement.
11. Proof that taxes, fees, and similar obligations are paid.
12. Waivers and releases.

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Contract Project Coordinator.
B. Electronic document submittal service.
C. Meetings.
D. Construction progress schedule.
E. Coordination drawings.
F. Coordination of space.
G. Contractor responsibilities.
H. General Wage Determination (Davis Bacon)
I. FEMA Documentation
J. Submittals for review, information, and project closeout.
K. Product data.
L. Manufacturer's instructions.
M. Manufacturer's certifications.
N. Applicator or installer's certification.
O. Shop drawings.
P. Samples.
Q. Schedule of submittals.
R. Number of copies of submittals.
S. Submittal procedures.

1.02 CONTRACTOR PROJECT COORDINATOR

A. Contractor shall employ the services of a qualified coordinator at the project site for the duration of this Work with his sole duties allocated to this project only. Coordinator may be the non-working superintendent required by general conditions and must coordinate all phases of the work. Subcontractors are required to provide a working foreman who will serve as his coordinator to the contractor.
    1. Qualifications:
        a. Experienced in field work of the type required for this project.
    2. Submit name, address and qualifications to the Architect.
B. Coordinator Duties:
    1. Coordinate his work with the Owner, all subcontractors and all other contractors:
        a. For temporary utilities.
        b. With the work of trades specified in Divisions 2 thru 48.
        c. Throughout this work, it will be required that the contractor and/or subcontractors apply their material to or over work, either existing or done by others, and which would affect his work. The coordination of all such work is the responsibility of this coordinator. However, it is the responsibility of each contractor, subcontractor or supplier to comply with this Section and 01 6000 whether or not it is specifically required, by repeating in his particular section of these specifications.
    2. Coordinate his schedule with the Owner, all contractors and/or subcontractors.
        a. Verify timely deliveries of products for installation by his forces or by other trades.
        b. Verify that labor and materials are adequate to maintain construction schedules.

3. All contractors and/or subcontractors receiving items from other contractors and/or subcontractors for installation in his work, as specified or as required, shall at his expense, do the following:
    a. Receive, unload, transport, store, protect and install.
    b. Inspect all items, at time of receiving from carrier, for all damage, concealed or otherwise.
    c. Record with the contractor the receiving of all items and report any damage immediately after receiving. Failure to do so will make the receiving contractor and/or subcontractor responsible for damage, late shipment, short shipment, etc.
4. All contractors and/or subcontractors furnishing items to other contractors and/or subcontractors for installation shall:
    a. Properly schedule delivery with using contractor and/or subcontractor.
    b. Deliver at such time and sequence as necessary to not delay the work of the installing contractor, other subcontractors or the overall job schedule.
    c. Furnish at proper time to meet 4.b above, all instruction and/or drawings necessary for installation and if necessary, his personnel at the job site or installation point, for instruction or supervision.
    d. Periodically inspect the installation with his personnel at the job site or installation point for conformity to his needs. Report to contractor any discrepancies.
    e. Deliver all items F.O.B. job site or point of installation.
5. Conduct conferences among his subcontractors and other concerned parties as necessary to:
    a. Maintain coordination and schedules.
    b. Resolve matters in dispute.
    c. Contractor to record minutes of all meetings.
6. Participate in Project Meetings:
    a. Report his progress and his subcontractors' progress.
    b. Recommend needed changes in schedules.
    c. Contractor to record minutes of all meetings.
7. Temporary Utilities:
    a. Coordinate installation, operation and maintenance, to verify compliance with Project requirements and with contract documents.
    b. Verify adequacy of service and maintenance at required locations.
8. Shop Drawings, Product Data and Samples:
    a. Prior to submittal, review for compliance with contract documents.
        1) Check field dimensions and clearance dimensions.
        2) Check relation to available space.
        3) Check anchor bolt settings.
        4) Review the effect of any changes on the work of other contracts or trades.
        5) Check compatibility and space requirements with equipment, materials and/or finishes and work of other trades.
        6) Check motor voltages, control characteristics, controls, interlocks, wiring and control diagrams.
9. Coordination Drawings:
    a. Prepare one (1) coordinated drawing, to assure coordination of work of, or affected by ceiling work, plumbing, sprinkler, mechanical and electrical, or to resolve conflicts.
    b. Reproduce and distribute reviewed copies of all concerned parties.
10. Verify that his contractor and his subcontractor maintain accurate record documents.
11. Substitutions and Changes:
    a. Review proposals and requests:
        1) Check for compliance with contract documents.
        2) Verify compatibility with work and equipment of other trades.
    b. Recommend action to contractor, Architect and/or Owner as applicable.

12. Observe Work for compliance with requirements of contract documents.
    a. Maintain list of observed deficiencies and discrepancies.
    b. Promptly report deficiencies or discrepancies to Architect.
13. Assemble documentation for handling of claims or disputes involving the various work trades.
14. Equipment Startup:
    a. Check to assure that utilities and specified connections are complete and that equipment is in operable condition.
    b. Observe test, adjust and balance.
    c. Record results, including time and date of startup and promptly report same to Contractor and Architect.
15. Inspection of Materials and Equipment:
    a. Prior to inspection, check that equipment and materials are clean, repainted as required, tested and operational.
    b. Assist inspector; prepare list of items to be completed or corrected.
16. Assemble record documents and transmit to Architect in complete form. Do not send data that is not complete covering all items.
17. Verify and be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work.
18. Coordinate scheduling, submittals, and work of the various sections of specifications to assure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
19. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
20. In finished areas, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

1.03 CONTRACTOR'S COORDINATION SCHEDULE

A. The coordination schedule designates areas of basic responsibility of contractors and subcontractors for items of work but does not define scope.

B. Refer to the respective sections of specifications for detailed descriptions of work required.

C. Coordinator:
   1. Maintain coordination schedule throughout construction period.
   2. Record changes in responsibilities due to:
      a. Modifications to contract.
      b. Field orders.
      c. Delays beyond control of contractor.
   3. Reproduce and distribute revised schedule promptly after each change to the contractors, subcontractors and one (1) copy to the Architect.

1.04 CONTRACTOR’S PROJECT DOCUMENTATION

A. General Wage Determination & Prevailing Wages (Davis Bacon) and Documentation: The Contractor shall be responsible for implementing and ensuring General Wage Determination (Davis Bacon) is included and a part of the contract throughout the entire project duration.

   1. General Davis-Bacon wage determinations are published online at www.sam.gov and are available for the contractor to incorporate into covered contracts and for the contractor to post at the job site of project.

   2. The Contractor is to maintain proper documentation of Wages throughout the duration of the project.

B. FEMA Documentation & Procedures: The Contractor shall be responsible for implementing and ensuring all required FEMA Documentation is included and a part of the contract throughout the duration of the entire project.

1. The Contractor is responsible for verification of all required FEMA documentation and submittal procedures/time mandates.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

A. Documents transmitted for purposes of administration of the contract may be in electronic (PDF) format and transmitted via a secure Internet-based service that receives and stores documents, and notifies addressees via email, subject to approval by the owner and the architect.
   1. Shop Drawings: Submit one paper copy of designated shop drawings as directed by the architect, as well as the electronic format document for all shop drawings.
   2. Besides submittals for review, information, and closeout, this procedure applies to requests for information (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant, authorized by the owner, wishes to make part of the project record.
   3. Contractor and Architect are required to use this service.
   4. It is Contractor's responsibility to submit documents in PDF format, apart from the service storage site, as required.
   5. Subcontractors, suppliers, and Architect's consultants will be permitted to use the service at no extra charge.
   6. Paper document submittals may be reviewed at the discretion of the architect. The architect may elect to review documents on paper and return scanned images to the contractor.
   7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.
   8. Processing of all documents submitted to the Architect will occur Monday through Thursday from 9am to 5pm. Any documents received on Friday will be processed on the following Monday.

B. Training: Web-based training sessions will be arranged for all participants, with representatives of Architect and Contractor participating.
   1. Representatives of Owner are scheduled and included in this training.

C. Project Closeout:

1. Owner will determine when to terminate the service for the project. Notify the owner and architect 30 days prior to termination.

2. The contractor is responsible for preserving and compiling digital archive copies of files for Owner and architect.

3.02 MEETINGS

A. Project Meetings:
   1. The Architect will initiate the preconstruction conference, coordinating with the Owner and the contractor. The contractor, thru his project coordinator, will schedule and administer periodic progress meetings on a weekly basis (or as required by progress of the work) and preinstallation meeting (where required by individual specification sections). Contractor is to:

a. Prepare agenda and preside for meetings.
b. Distribute written notice of each meeting in advance of meeting date with a copy to Architect.
c. Make physical arrangements for meetings.
d. Record the minutes.
e. Reproduce and distribute copies of minutes within a reasonable time after each meeting:
    1) To all contractors, subcontractors and/or participants in the meeting.
    2) To all parties affected by decisions made at the meeting.
    3) Furnish one (1) copy each of minutes to Architect, Mechanical and Electrical Engineers and Owner.
    4) Submit under provisions of Section 01 7200 Project Record Documents.

2. Coordination representatives of the contractor, subcontractors and suppliers are required to attend the meetings and shall be qualified and authorized to act on behalf of the entity each represents.

B. Preconstruction Meeting:
1. The Architect will initiate the preconstruction conference, coordinating with the Owner and the contractor. This meeting will normally be held at the site of the project immediately after or concurrent with the award of the contract.
2. Record of attendance and identification of representatives:
    a. Owner and facility representatives.
    b. Architect, Engineers, project manager(s), superintendent, subcontractors and suppliers
3. Confirm status of contract.
4. Communication:
    a. All communication between Owner and contractor shall be through Architect.
    b. All correspondence to bear project name and Architect's Project Number.
5. Check need for contract documents, including record documents set, and fire marshal's stamped set, when appropriate.
6. Construction Schedules:
    a. Notice to proceed.
    b. Contract time.
    c. Critical work sequencing, initial progress schedule.
    d. Major equipment deliveries and priorities.
    e. Coordination.
    f. Projected substantial and final completion.
7. Builder's Risk Insurance.
8. Contractor's use of premises.
    a. Site.
    b. Facility policies and procedures.
    c. Security and housekeeping.
9. Construction facilities and temporary utilities.
10. Architect's field observation reports.
11. Progress meetings and other meetings.
12. Progress payments, applications for payment.
    a. Form, content, and procedure.
    b. Stored materials.
    c. Retainage and consent of surety.
    d. Schedule of values.
    e. Attachments.
13. Submittals:
    a. Initial construction schedule.
    b. Updated progress schedules.

c. Shop drawing log.
d. Shop drawings, product data and samples.

14. Change orders and written orders for minor changes:
    a. Itemization of costs.
    b. Extensions of time.
15. Weekly payroll reports and wage rate regulations, if applicable.
16. Testing and laboratory reports.
17. Contract Close Out:
    a. Substantial completion.
    b. Final inspection.
    c. Project record documents.
    d. Final payment.

C. Progress Meetings:
1. Schedule regular periodic meetings.
2. Location of meetings: Contractor's on-site office.
3. Attendance:
    a. Architect and/or Owner as needed.
    b. Contractor's Project Manager and Job Superintendent.
    c. Subcontractors as appropriate to the agenda.
    d. Suppliers as appropriate to the agenda.
    e. Others as needed appropriate to the agenda.
4. Suggested Agenda:
    a. Review and approval of minutes of previous meeting.
    b. Review of work progress.
    c. Field observations, problems, and conflicts.
    d. Problems which impede construction schedule.
    e. Review of offsite fabrication, delivery schedules.
    f. Corrective measures and procedures to regain projected schedule.
    g. Coordination of schedules.
    h. Maintenance of quality standards.
    i. Other business as appropriate.

D. Preinstallation Meetings:
1. When required in individual specification section, the Contractor shall convene a preinstallation conference at agreed location prior to commencing work of the section.
2. Require attendance of parties directly affecting, or affected by, work of the specific section.
3. Notify Architect a minimum of four (4) days in advance of meeting date.
4. Prepare agenda, preside at conferences, record minutes and distribute copies within two (2) days after conference to participants, with two (2) copies to Architect.
5. Review conditions of installation, preparation and installation procedures, and coordination with related work.

3.03 PROGRESS MEETINGS

A. The Contractor shall schedule and administer meetings throughout progress of the Work at maximum weekly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required: Job superintendent, major subcontractors and suppliers, Owner, Architect, as appropriate to agenda topics for each meeting.

D. Agenda:
1. Review minutes of previous meetings.
2. Review of Work progress.

3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Maintenance of progress schedule.
7. Corrective measures to regain projected schedules.
8. Planned progress during succeeding work period.
9. Maintenance of quality and work standards.
10. Effect of proposed changes on progress schedule and coordination.
11. Other business relating to Work.

E. Record minutes and distribute copies within two days after meeting to participants, with electronic copies to Architect, Owner, participants, and those affected by decisions made.

3.04 COORDINATION DRAWINGS

A. Provide information required by project coordinator for preparation of coordination drawings.

B. Review drawings prior to submission to Architect.

C. Coordination drawings are not shop drawings and shall not be submitted to Architect for approval.

D. Coordination drawings show relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in space provided and to function as intended.

E. Prepare composite coordination drawings to scale of 1/8" = 1'-0" or larger, detailing major elements, components and systems of architectural, structural, mechanical and electrical equipment and materials in relationship with each other and with building components. Include dimensions.

F. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to efficient flow of Work affecting one or more trades.

G. Indicate scheduling, sequencing, movement and positioning of large equipment into building during construction.

H. Prepare floor plans, elevations and details to indicate penetrations in floors, walls and ceilings and their relationship to other penetrations and installations.

I. Prepare reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communications systems components, sprinklers and other ceiling mounted devices.

J. Show interrelationship of components to be shown on separate shop drawings.

K. Indicate required installation sequences.

3.05 COORDINATION OF SPACE

A. Coordinate use of project space and sequence of installation of plumbing, fire protection, mechanical and electrical Work. Follow routings shown for pipes, ducts and conduits as closely as practicable, with due allowance for available physical space. Make runs parallel with building lines. Utilize space as efficiently as possible to maximize accessibility for other installations, for maintenance and for repairs.

B. Layout of mechanical and electrical systems and related products indicated on drawings is diagrammatic. Variations in alignment, elevation and details required to avoid interferences and satisfy architectural and structural limitations are not necessarily shown.

C. Prior to installation of materials and equipment, review and coordinate Work with architectural and structural drawings to establish exact space conditions. Where available space is inadequate or where reasonable modifications are not possible, request information from Architect before proceeding.

D. Coordinate installation to prevent conflicts and cooperate in making, without additional charge, reasonable modifications in layout as needed.

E. Provide clear access to control joints, valves, strainers, control devices and specialty items of every nature related to such systems and equipment to obtain maximum head room. Provide adequate clearances as necessary for operation and maintenance.

3.06 CONTRACTOR RESPONSIBILITIES

A. The contractor, or any subcontractor, as applicable to his submittals, shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Architect's approval of shop drawings, product data or samples unless the contractor and subcontractor have specifically informed the Architect, in writing, of such deviation at the time of submission and the Architect has given written approval to the specific deviation. The contractor or any subcontractor, as applicable to his submittals, shall not be relieved from responsibility for errors or omissions in the shop drawings, product data or samples by the Architect's approval thereof. The Architect's approval of a separate item shall not indicate approval of an assembly in which the item functions.

B. Contractor is responsible for submitting shop drawings that are job specific and unique to the project. Submittals determined to be generic will be returned without review by Architect.

C. Contractor shall review all submittals prior to forwarding to Architect. Submittals determined not to have been reviewed by Contractor will be returned without review by Architect.

3.07 SCHEDULE OF SUBMITTALS

A. Submit initial Schedule of Submittals for product data, shop drawings, samples and quality control submittals within 7 days after date of Owner-Contractor Agreement. Proceed for Architect/Engineer review and approval.

B. Do not submit product data, shop drawings, samples, or quality control submittals until Schedule of Submittals have been approved.

C. Revise and resubmit as required.

D. Indicate on Schedule of Submittals the following information:
   1. Section number of specification that requires a submittal.
   2. Title of submittal.
   3. Contractor, subcontractor's trade.
   4. Date that Architect will receive the submittal.
   5. Required return dates to contractor.

E. Do not schedule submittals to where architect will have more than five submittals to be processed and returned for any given period of time.

3.08 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Submittals for information.
   3. Manufacturer's instructions.
   4. Manufacturer's certificates.
   5. Applicator or installer's certificates.
   6. Shop drawings.
   7. Samples for selection.
   8. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

C. Samples will be reviewed only for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below.and for record documents purposes described in Section 01 7000 Project Record Documents.

3.09 PRODUCT DATA

A. Product data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the contractor or any subcontractor to illustrate a material, product or system for some portion of the Work.

B. Preparation:
   1. Clearly mark each copy to identify pertinent products or models.
   2. Show performance characteristics and capacities.
   3. Show dimensions and clearances required.
   4. Show wiring or piping diagrams and controls.

C. Manufacturer's standard schematic drawings and diagrams:
   1. Modify drawings and diagrams to delete information which is not applicable to the Work.
   2. Supplement standard information to provide information specifically applicable to the Work.

3.10 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Sustainable design submittals and reports.
   3. Certificates.
   4. Test reports.
   5. Inspection reports.
   6. Manufacturer's instructions.
   7. Manufacturer's field reports.
   8. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner. No action will be taken.

3.11 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification sections, retain at the project site one (1) copy of manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting and finishing, in quantities specified for product data.

B. Identify conflicts between manufacturers' instructions and contract documents, if any exist.

3.12 MANUFACTURER'S CERTIFICATES

A. When specified in individual specification sections, submit manufacturers' certificate to Architect for review, in quantities specified for product data.
   1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference date, affidavits and certifications as appropriate.

B. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

3.13 APPLICATOR OR INSTALLER'S CERTIFICATION

A. When specified in individual specification sections under Article entitled "Qualification" that the applicator or installer is certified approved by the manufacturer for the product specified.

3.14 SHOP DRAWINGS

A. Shop drawings are drawings, diagrams, schedules and other data specifically prepared for the Work by the contractor or any subcontractor, manufacturer, supplier or distributor or illustrate some portion of the Work.

B. Drawings shall be presented in a clear and thorough manner in appropriate size and scale with details, identified by reference to sheet and detail, schedule or room numbers shown on Contract Drawings.

3.15 SAMPLES

A. Samples are physical examples which illustrate materials, equipment or workmanship and establish standards by which the work will be judged.

B. Submit samples to illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

C. Submit samples of finishes from the full range of manufacturers' standard colors in custom colors selected, textures and patterns for Architect's selection.

D. Include identification on each sample, with full project information.

E. Submit the number or samples specified in individual specification sections; one (1) of which will be retained by Architect.

F. Reviewed samples which may be used in the Work are indicated in individual specification sections.

3.16 SUBMITTALS FOR PROJECT CLOSEOUT - SEE SECTION 01 7000 PROJECT RECORD DOCUMENTS

A. Submit for Owner's benefit during and after project completion.

3.17 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
   1. After review, produce duplicates.
   2. Retained samples will not be returned to Contractor unless specifically so stated.

3.18 SUBMITTAL PROCEDURES

A. Shop Drawing Procedures:
   1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting the Contract Documents and coordinating related Work.
   2. Do not reproduce the Contract Documents to create shop drawings.
   3. Generic, non-project specific information submitted as shop drawings do not meet the requirements for shop drawings.

B. Transmit each submittal with a copy of approved submittal form.

C. Transmit each submittal with approved form.

D. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.

E. Identify Project, Contractor, subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.

F. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and contract documents.
   1. Contractor shall review all submittals prior to forwarding to Architect. Submittals determined not to have been reviewed by Contractor will be returned without review by Architect

G. Deliver samples to Architect at business address.

H. Schedule submittals to expedite the Project, and coordinate submission of related items.

I. For each submittal for review, allow 15 Business days excluding delivery time to and from the Contractor.

J. Processing of all submittals to the Architect will occur Monday through Thursday from 9am to 5pm. Any documents received on Friday will be processed on the following Monday.

K. Identify variations from contract documents and product or system limitations that may be detrimental to successful performance of the completed Work.

L. Indicate dimensions, including dimensions verified in the field. Indicate adjacent construction conditions and substrates. Indicate configuration of components and assemblies; indicate required clearances. Indicate fasteners, anchors and attachments as recommended by the manufacturer to be suitable for the application.

M. Check compatibility with the work of other sections, including equipment, electrical characteristics and operational control.

N. Check substrates and adjacent construction; verify adequacy of conditions in accordance with submittal requirements.

O. Provide space for Contractor and Architect review stamps.

P. When revised for resubmission, identify all changes made since previous submission.

Q. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

Q. Submittals not requested will not be recognized or processed.

END OF SECTION

SECTION 01 3010

WEATHER DELAYS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Extension of Contract Time.

B. Standard baseline for average climatic range.

C. Inclement weather and weather delay days.

D. Documentation and submittals.

1.02 EXTENSIONS OF CONTRACT TIME

A. If the basis exists for an extension of time in accordance with the Construction Management Agreement Between the Owner and the Contractor, an extension of time on the basis of weather may be granted only for the number of Weather Delay Days in excess of the number of days listed as the Standard Baseline for that month.

1.03 STANDARD BASELINE FOR AVERAGE CLIMATIC RANGE

A. The Standard Baseline of average climatic range for the construction site was determined by weather data available from the Memphis area office of the National Weather Service covering the period of delay and the same calendar period for the five preceding years.

B. Standard Baseline shall be regarded as the normal and anticipated number of calendar days for each month during which construction activity shall be expected to be prevented and suspended by cause of inclement weather. Suspension of construction activity for the number of days each month as listed in the Standard Baseline is included in the Work and is not eligible for extension of Contract Time.

C. Standard Base line is as follows:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
6	6	7	7	8	5	5	5	3	5	7	7

1.04 INCLEMENT WEATHER AND WEATHER DELAY DAYS

A. Inclement Weather is defined as the occurrence of the following condition which prevents exterior construction activity or access to the site within twenty-four (24) hours:
   1. Rainfall in excess of five hundredths inch (0.05") liquid measure.

B. Whether or not a time extension is granted will depend upon the effect of the inclement weather on the work being performed during the period of delay. When the weather for the period of delay exceeds in intensity of frequency the five year average for the same period, a time extension will be considered. No extension will be granted for normal inclement weather conditions such as rain, snow, and freezing temperatures.

1.05 DOCUMENTATION AND SUBMITTALS

A. Submit daily jobsite work logs showing which and to what extent construction activities have been affected by weather on a monthly basis.

B. Submit actual weather data to support claim for time extension obtained from the Memphis area office of the National Weather Service.

C. Use Standard Baseline data provided in this Section when documenting actual delays due to weather in excess of the average climatic range.

D. Organize claim and documentation to facilitate evaluation on a basis of calendar month periods, and submit in accordance with the procedures for Claims established in the contract for construction.

E. If an extension of the Contract Time is appropriate, it shall be affected in accordance with the provisions of the Construction Management Agreement and the applicable General Requirements.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 3216

CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preliminary schedule.

B. Construction progress schedule, bar chart type.

1.02 RELATED SECTIONS

A. Section 01 1000 - Summary: Work sequence.

1.03 SUBMITTALS

A. Within 10 days after date of Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.

B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
   1. Include written certification that major contractors have reviewed and accepted proposed schedule.

D. Within 10 days after joint review, submit complete schedule.

E. Submit updated schedule with each Application for Payment.

F. Submit the number of opaque reproductions that Contractor requires, plus two copies that will be retained by Architect.

G. Submit under transmittal letter form specified in Section 01 2000.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each major element of construction.

B. Identify each item by specification section number.

C. Identify work of separate stages and other logically grouped activities.

D. Provide sub-schedules to define critical portions of the entire schedule.

E. Show projected percentage of completion for each item as of the first day of each week for the full construction period.

F. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

G. Indicate delivery dates for owner-furnished products and products identified under Allowances.

H. Coordinate content with schedule of values specified in Section 01200.

I. Provide legend for symbols and **abbreviations** used.

3.03 BAR CHARTS

A. Include a separate bar for each major portion of Work or operation.

B. Identify the first work day of each week.

3.04 REVIEW AND EVALUATION OF SCHEDULE

A. Participate in joint review and evaluation of schedule with Architect at each submittal.

B. Evaluate project status to determine work behind schedule and work ahead of schedule.

C. After review, revise as necessary as result of review, and resubmit within 10 days.

3.05 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

C. Annotate diagrams to graphically depict current status of Work.

D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

E. Indicate changes required to maintain Date of Substantial Completion.

F. Submit reports required to support recommended changes.

G. Provide narrative report to define problem areas, anticipated delays, and impact on the schedule. Report corrective action taken or proposed and its effect including the effects of changes on schedules of separate contractors.

3.06 DISTRIBUTION OF SCHEDULE

A. Distribute copies of updated schedules to Contractor's project site file, to Subcontractors, suppliers, Architect, Owner, and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

END OF SECTION

SECTION 01 3553

SECURITY PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Security measures including entry control, personnel identification, and miscellaneous restrictions.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Use of premises and occupancy.

B. Section 01 5000 - Temporary Facilities and Controls: Temporary lighting.

1.03 SECURITY PROGRAM

A. Coordinate security requirements with Owner's security program.

B. Protect Work, existing premises and Owner's operations under the control of the Contractor from theft, vandalism, and unauthorized entry.

C. Initiate program in coordination with Owner's existing security system at project mobilization.

D. Maintain program throughout construction period until Owner acceptance precludes the need for Contractor security.

1.04 ENTRY CONTROL

A. Restrict entrance of persons and vehicles into Project site and existing facilities under the control of the Contractor.

B. Allow entrance only to authorized persons with proper identification.

D. Owner will control entrance of persons and vehicles related to Owner's operations.

1.05 PERSONNEL IDENTIFICATION

A. Each person authorized to enter premises shall have a US Government issued identification card.

B. Card to Include: Personal photograph, name, and expiration date.

1.06 RESTRICTIONS

A. Owner will provide the contractor restrictions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 4000

QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. References and standards.

B. Quality assurance submittals.

C. Mock-ups.

D. Control of installation.

E. Tolerances.

F. Testing and inspection services.

1.02 RELATED REQUIREMENTS

A. Section 01 2100 – Allowances.

B. Section 01 3000 – Administrative Requirements.

C. Section 01 6000 – Product Requirements.

1.03 REFERENCE STANDARDS

A. ASTM C 1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation, current edition.

B. ASTM E 329 - Standard Specification for Agencies Engaged Construction Inspection and/or Testing; current edition.

C. ASTM E 543 - Standard Specification for Agencies Performing Nondestructive Testing; current edition.

1.04 SUBMITTALS

A. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.

B. Test Reports: After each test/inspection, promptly submit two copies of report to Architect, Structural Engineer and to Contractor.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of inspector.
      d. Date and time of sampling or inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of test/inspection.
      h. Date of test/inspection.
      i. Results of test/inspection.
      j. Conformance with Contract Documents.
      k. When requested by Architect, provide interpretation of results.

   2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept

expressed in the contract documents, or for Owner's information.

C. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
   1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
   2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

D. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

E. Erection/Shop Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
   1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
   2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.

1.05 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

F. Neither the contractual relationships, duties, nor responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

G. The following is a representative, but not necessarily the total list of such associations, institutes and societies, together with the abbreviation by which each is identified.

AAMA	Architectural Aluminum Manufacturer's Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AIA	American Institute of Architects
AIEE	American Institute of Electrical Engineers
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
APA	American Plywood Association
API	American Petroleum Institute
ASA	American Standards Association
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers

ASTM	American Society of Testing and Materials
AWI	Architectural Woodwork Institute
AWS	American Welding Society
AWSC	American Welding Society Code
AWWA	American Water Works Association
BIA	Brick Institute of America
CSI	Construction Specifications Institute
DHI	Door and Hardware Institute
EPA	Environmental Protection Agency
FIA	Factory Insurance Association
FS	Federal Specifications
GA	Gypsum Association
IEEE	Institute of Electrical and Electronic Engineers
IES	Illuminating Engineering Society
IGSS	Insulating Glass Certification Council
NBFU	National Board of Fire Underwriters
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NWMA	National Woodwork Manufacturers Association
NWWDA	National Wood Window and Door Association
OSHA	Occupational Safety and Hazard Act
PCA	Portland Cement Association
SDI	Steel Door Institute
SIGMA	Sealed Insulating Glass Manufacturer's Association
SJI	Steel Joists Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association, Inc.
SPRI	Single Ply Roofing Institute
SSPC	Steel Structures Painting Council
TCA	Tile Council of American, Inc.
UL	Underwriters' Laboratories, Inc.
USASI	United States of America Standards Institute

1.06 TESTING AND INSPECTION AGENCIES

A. Reference Section 01 2100 – Allowances for testing requirements

B. Owner will employ a testing agency and pay for all construction testing and special seismic/inspections as required under Chapter 17 of the 2012 International Building Code.

C. Contractor will employ services of an independent testing agency acceptable to Owner and Architect/Engineer to perform other specified testing and inspection required under Division 1-48.

D. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

E. Contractor Employed Agency:
   1. Testing agency: Comply with requirements of ASTM E 329, ASTM E 543, and ASTM C 1077.
   2. Inspection agency: Comply with requirements of ASTM E329.
   3. Laboratory: Authorized to operate in the State in which the Project is located.
   4. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
   5. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have Work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

A. Tests will be performed under provisions identified in this section and identified in the respective product specification sections.

B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Accepted mock-ups shall be a comparison standard for the remaining Work.

D. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, remove mock-up and clear area when directed to do so.

3.03 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

A. See individual specification sections for testing required by the Contractor.

B. Testing Agency Duties:
   1. Test samples of mixes submitted by Contractor.
   2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
   3. Perform specified sampling and testing of products in accordance with specified standards.
   4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   5. Promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or products.
   6. Perform additional tests and inspections required in the specifications and by the Architect.
   7. Submit reports of all tests/inspections specified or required.

C. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of Contractor.
   4. Agency has no authority to stop the Work.

D. Contractor Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work. Coordinate the construction schedule with required agency's activities, monitor schedules and assure timely agency schedule interface.
   3. Provide incidental labor and facilities:
      a. To provide access to Work to be tested/inspected.
      b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
      c. To facilitate tests/inspections.
      d. To provide storage and curing of test samples.
   4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
   5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
   6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

E. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.

F. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

3.05 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not conforming to specified requirements.

B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct an appropriate remedy or adjust contract sum.

C. Defective Work may remain, but contract price will be adjusted to new price at sole discretion of Architect/Engineer and Owner.

D. Defective Work will be partially repaired to instructions of Architect/Engineer and contract price will be adjusted to new contract price at discretion of Architect/Engineer and Owner.

E. Individual specification sections may modify these options or may identify specific formula or percentage contract price reduction.

F. Authority of Architect/Engineer and Owner to assess defects and identify contract sum adjustments is final.

G. Non-Payment for Rejected Products:
   1. Payment will not be made for rejected products for any of the following:
      a. Products wasted or disposed of in a manner that is not acceptable.
      b. Products determined as unacceptable before or after placement.
      c. Products not completely unloaded from transporting vehicle.
      d. Products placed beyond lines and levels of required Work.
      e. Products remaining on hand after completion of Work.
      f. Loading, hauling and disposing of rejected products.

END OF SECTION

SECTION 015000

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

1.2 USE CHARGES

A. Installation and removal of and use charges for temporary facilities to be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Engineer, testing agencies, and authorities having jurisdiction.

B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services and metering as required for construction operations.

C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services and metering as required for construction operations.

1.3 INFORMATIONAL SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.

B. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

D. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.

E. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:

1. Locations of dust-control partitions at each phase of work.
2. HVAC system isolation schematic drawing.

3. Location of proposed air-filtration system discharge.
4. Waste-handling procedures.
5. Other dust-control measures.

1.4 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Accessible Temporary Egress: Comply with applicable provisions in the DOJ's "2010 ADA Standards for Accessible Design", and, ICC A117.1.

1.5 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

A. Field Offices:

1. Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Engineer, Construction Manager, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents, including file cabinets, plan tables, plan racks, and bookcases.
2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- square tack and marker boards.
3. Drinking water and private toilet.
4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
5. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

2.2 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system,

provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction.

C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service:

1. Install water service and distribution piping in sizes and pressures

adequate for construction.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.

F. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

G. Electric Power Service:

1. Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

a. Install electric power service underground unless otherwise indicated.

H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

3.4 SUPPORT FACILITIES INSTALLATION

A. Comply with the following:

1. Maintain support facilities until Engineer schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain, including curbs, pavement, and utilities.

2. Maintain access for fire-fighting equipment and access to fire hydrants.

D. Parking: Provide temporary offsite parking areas for construction personnel.

E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

F. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.

a. Provide temporary, directional signs for construction personnel and visitors.

3. Maintain and touch up signs, so they are legible at all times.

G. Waste Disposal Facilities:

1. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
2. Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

I. Existing Elevator Use: Use of Owner's existing elevators will be permitted, provided elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.

1. Do not load elevators beyond their rated weight capacity.
2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work, so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.

J. Temporary Stairs: Until permanent stairs are available, provide temporary stairs

where ladders are not adequate.

K. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.

1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas, so no evidence remains of correction work.

L. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

C. Temporary Erosion and Sedimentation Control:

1. Comply with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Section 311000 "Site Clearing."
2. Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, in accordance with erosion- and sedimentation-control Drawings, requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

a. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
b. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
c. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
d. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

D. Stormwater Control: Comply with requirements of authorities having jurisdiction.

Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Tree and Plant Protection:

1. Comply with requirements specified in Section 015639 "Temporary Tree and Plant Protection."
2. Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals, so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.

G. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.

1. Extent of Fence: As indicated on Drawings.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel.

H. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.

I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

J. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.

K. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

L. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of authorities having jurisdiction.
2. Develop and supervise an overall fire-prevention and -protection program

for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign, stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.6 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.

1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
3. Indicate methods to be used to avoid trapping water in finished work.

B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard and replace stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.

D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

3.7 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION

SECTION 01 5100

TEMPORARY UTILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary Utilities: Electricity, lighting, heat, ventilation, and water.

B. Fire Protection.

C. Construction Aids.

1.02 RELATED REQUIREMENTS

A. Section 01 5000 - Temporary Facilities and Controls:
   1. Temporary telecommunications services for administrative purposes.
   2. Temporary sanitary facilities required by law.

1.03 TEMPORARY ELECTRICITY

A. Cost: By Owner.

B. Connect to Owner's existing power service.
   1. The Electrical Subcontractor is to furnish and install at his expense and arrangement, all means of bringing electrical power, wiring, etc. from the Owner's point of source to the point of use or need including receptacle devices, wiring and/or lighting fixtures and their complete removal at completion, as may be needed to provide adequate artificial lighting and power for all areas of the Work. Owner's electrical power source shall not be interrupted without specific approval and arrangement with the Owner
   2. Do not disrupt Owner's need for continuous service.
   3. Exercise measures to conserve energy.

C. Provide temporary electric feeder from existing building electrical service at location as directed and in quantities designated on the drawings and/or within Division 16 of these specifications.

D. Complement existing power service capacity and characteristics as required. If requirements for current/voltage exceed the Owner's capacity or type as described above, the needing Contractor and/or Subcontractor shall arrange for, pay for and provide his own source at his total expense, including removal of same at completion of the Work.

E. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required. Provide flexible power cords as required.

F. Provide main service disconnect and over-current protection at convenient location. The Electrical Subcontractor must pay for and provide adequate protection and/or protection devices to protect the Owner's electrical source and supply including branch circuits, panelboards, etc. as may be deemed necessary for a complete system in accord with all local and national codes.

G. Permanent convenience receptacles may be utilized during construction.

1.04 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain incandescent lighting for construction operations to achieve a minimum lighting level of 2 watt/sq ft .

B. Provide and maintain 1 watt/sq ft lighting to exterior staging and storage areas after dark for security purposes.

C. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

D. Maintain lighting and provide routine repairs.

E. Permanent interior building lighting may not be utilized during construction until all dust producing construction has ceased.

1.05 TEMPORARY HEATING

A. Cost of Energy: By Owner.

B. Provide heating devices and heat as needed to maintain specified conditions for construction operations.

C. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

D. No portable heaters are allowed.

E. Owner's existing heat plant may be used.
   1. Exercise measures to conserve energy.
   2. Enclose building prior to activating temporary heat.

F. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

1.06 TEMPORARY COOLING

A. Cost of Energy: By Owner.

B. Provide cooling devices and cooling as needed to maintain specified conditions for construction operations.

C. Maintain maximum ambient temperature of 80 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

D. Owner's existing cooling plant may be used.
   1. Exercise measures to conserve energy.
   2. Enclose building prior to activating temporary cooling.

E. Prior to operation of permanent equipment for temporary cooling purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

1.07 TEMPORARY VENTILATION

A. Utilize existing ventilation equipment. Extend and supplement equipment with temporary fan units as required to maintain clean air for construction operations.

1.08 TEMPORARY WATER SERVICE

A. Cost of Water Used: By Owner.

B. Provide and maintain suitable quality water service for construction operations at time of project mobilization.

C. Connect to existing water source.
   1. Exercise measures to conserve water.

D. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing.

E. The Plumbing Subcontractor is to furnish and install all valves, piping, hose, fittings, vacuum

breakers, back flow preventers and/or devices required to connect and transmit this water from the Owner's point of source to the point of his need in adequate quantity for progress of the work at his expense. All such materials shall be removed at the end of the work. Owner's piping and water supply shall not be interrupted without specific approval and arrangement with the Owner.

F. If requirements for water exceed the Owner's provided service, as described above, the needing Contractor and/or Subcontractor shall provide his own source at his total expense including removal of same at completion of the Work.

1.09 TEMPORARY FIRE PROTECTION

A. The General Contractor is to provide proper and adequate portable fire extinguishing equipment at his operation when work is in progress, including requirements for field offices and storage sheds.

1.10 CONSTRUCTION AIDS

A. Provide construction aids and equipment required by personnel and to facilitate the execution of the Work: Scaffolds, staging, ladders, ramps, runways, platforms, lifts, railings, hoists, cranes, chutes, appliances, equipment and other facilities. Maintain all facilities and equipment in a first-class condition for the safety and use of this construction.

B. Prolonged parking or blocking of traffic at the site will not be permitted. Provide protection necessary to maintain traffic arteries in a first class condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 015639

TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of this Section Includes: General protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.

B. Related Requirements:

1. Section 311000 "Site Clearing" for limits on clearing; disposition of vegetative clearing debris.
2. Section 31 2000 - Earthwork: Temporary and permanent grade changes for erosion control.
3. Section 32 1123 - Aggregate Base Courses: Temporary and permanent roadways.

1.2 DEFINITIONS

A. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.

B. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings, defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated, defined by a circle concentric with each tree with a radius 12 times the tree's caliper size and with a minimum radius of 96 inches unless otherwise indicated. Reference Demo and Tree Preservation Plan for tree protection fence locations.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include plans, elevations, and sections showing trees and plants to be protected, locations of protection-zone fencing and signage, and the relationship between equipment-movement routes and material storage locations with protection zones.

C. Samples: For each type of the following:

1. Organic Mulch: 1-pint volume of organic mulch; in sealed plastic bags

labeled with composition of materials by percentage of weight and source of mulch.
2. Protection-Zone Fencing: Assembled Samples of manufacturer's standard size made from full-size components.
3. Protection-Zone Signage: Full-size Samples of each size and text, ready for installation.

D. Tree-Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.

1.5 INFORMATIONAL SUBMITTALS

A. Certification: From ISA certified arborist, certifying that trees indicated to remain have been protected during construction in accordance with recognized standards and that trees were promptly and properly treated and repaired when damaged.

B. Maintenance Recommendations: From ISA certified arborist, for care and protection of trees affected by construction during and after completing the Work.

C. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.

1.6 QUALITY ASSURANCE

A. Arborist Qualifications: Certified Arborist as certified by ISA,Licensed arborist in jurisdiction where Project is located, Current member of ASCA, Registered Consulting Arborist as designated by ASCA.

1.7 FIELD CONDITIONS

A. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Moving or parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

B. Do not direct vehicle or equipment exhaust toward protection zones.

C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Backfill Soil: Stockpiled soil mixed with planting soil of suitable moisture content

and granular texture for placing around tree; free of stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth.

1. Mixture: Well-blended mix of 2 parts stockpiled soil to 1 part planting soil.
2. Planting Soil: Planting soil as specified in Section 329113 "Soil Preparation"

B. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:

1. Type: Shredded hardwood.

C. Protection-Zone Fencing: Fencing fixed in position and meeting one of the following requirements: Previously used materials may be used when approved by Architect.

1. Chain-Link Protection-Zone Fencing: Galvanized-steel fencing fabricated from minimum 2-inch opening, 0.148-inch diameter wire chain-link fabric; with pipe posts, minimum 2-3/8-inch OD line posts, and 2-7/8-inch OD corner and pull posts; with 1-5/8-inch OD top rails, ; with 0.177-inch diameter top tension wire and 0.177-inch diameter bottom tension wire; with tie wires, hog ring ties, and other accessories for a complete fence system.

   a. Height: 48 inches.

2. Wood Protection-Zone Fencing: Constructed of two 2-by-4 inch horizontal rails, with 4-by-4-inch preservative-treated wood posts spaced not more than 96 inches apart, and lower rail set halfway between top rail and ground.

   a. Height: 48 inches.

3. Plastic Protection-Zone Fencing: Plastic construction fencing constructed of high-density extruded and stretched polyethylene fabric with 2-inch maximum opening in pattern and weighing a minimum of 0.4 lb/ft; remaining flexible from minus 60 to plus 200 deg F; inert to most chemicals and acids; minimum tensile yield strength of 2000 psi and ultimate tensile strength of 2680 psi;secured with plastic bands or galvanized-steel or stainless steel wire ties; and supported by tubular or T-shape galvanized-steel posts spaced not more than 96 inches apart.

   a. Height: 48 inches.

4. Gates: Single- swing access gates matching material and appearance of fencing, to allow for maintenance activities within protection zones; leaf width As indicated.

D. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes prepunched and reinforced; legibly printed with nonfading lettering, stating “Notice: Tree Preservation Area DO NOT ENTER” or other verbiage as required by Urban Forester for the jurisdiction in which work will take

place.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

B. Tree-Protection Area: An Arborist shall examine all trees to remain and assess the health and maintenance needed for each individual tree. A report shall be generated from the Arborist and submitted to the Contractor, Owner and Landscape Architect.

3.2 PREPARATION

A. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

B. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated. Do not exceed indicated thickness of mulch.

1. Apply 4-inch uniform thickness of organic mulch unless otherwise indicated. Do not place mulch within 6 inches of tree trunks.

3.3 PROTECTION ZONES

A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones in a manner that will prevent people from easily entering protected areas except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.

1. Chain-Link Fencing: Install to comply with ASTM F567 and with manufacturer's written instructions.
2. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Architect.
3. Access Gates: Install where indicated; adjust to operate smoothly, easily, and quietly; free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Architect.

C. Maintain protection zones free of weeds and trash.

D. Maintain protection-zone fencing and signage in good condition as acceptable to Landscape Architect and remove when construction operations are complete and equipment has been removed from the site.

3.4 EXCAVATION

A. General: Excavate at edge of protection zones and for trenches indicated within protection zones in accordance with requirements in Section 312000 "Earth Moving" unless otherwise indicated.

B. Trenching within Protection Zones: Where utility trenches are required within protection zones, excavate under or around tree roots by hand or with air spade, or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots.

C. Do not allow exposed roots to dry out before placing permanent backfill.

3.5 ROOT PRUNING

A. Prune tree roots that are affected by temporary and permanent construction. Prune roots as follows:

1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
2. Temporarily support and protect roots from damage until they are permanently covered with soil.
3. Cover exposed roots with burlap and water regularly.
4. Backfill as soon as possible in accordance with requirements in Section 312000 "Earth Moving."

B. Root Pruning at Edge of Protection Zone: Prune tree roots by hand or using an air spade of the protection zone by cleanly cutting all roots to the depth of the required excavation.

C. Root Pruning within Protection Zone: Clear and excavate by hand or with air spade to the depth of the required excavation to minimize damage to tree root systems. If excavating by hand, use narrow-tine spading forks to comb soil to expose roots. Cleanly cut roots as close to excavation as possible.

3.6 CROWN PRUNING

A. Prune branches that are affected by temporary and permanent construction. Prune branches as directed by arborist.

1. Prune to remove only injured, broken, dying, or dead branches unless otherwise indicated. Do not prune for shape unless otherwise indicated.
2. Do not remove or reduce living branches to compensate for root loss caused by damaging or cutting root system.
3. Pruning Standards: Prune trees in accordance with ANSI A300 (Part 1) and as indicated on Drawings.

B. Cut branches with sharp pruning instruments; do not break or chop.

C. Chip removed branches and spread over areas identified by Architect.

3.7 REGRADING

A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

B. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

C. Minor Fill within Protection Zone: Where existing grade is 2 inches or less below elevation of finish grade, fill with backfill soil. Place backfill soil in a single uncompacted layer and hand grade to required finish elevations.

3.8 FIELD QUALITY CONTROL

A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

B. Reports: All trees disturbed or damaged within a tree protection area or easement are to be assessed and a report produced by an arborist. All trees to remain are to be evaluated individually in a report by an arborist. Report is to be reviewed and approved by the Landscape Architect. All associated cost of arborist and associated work recommended in reports are to be at the contractor’s expense. Including but not limited to pruning, dead wooding, tree removal and legal disposal of material offsite.

3.9 REPAIR AND REPLACEMENT

A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner approved by Architect.

1. Perform repairs of damaged trunks, branches, and roots within 24 hours in accordance with arborist's written instructions.
2. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.

B. Excess Mulch: Rake mulched area within protection zones, being careful not to injure roots. Rake to loosen and remove mulch that exceeds a 4-inch uniform thickness to remain.

3.10 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove excess excavated material, displaced trees, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION

SECTION 015713

TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Prevention of erosion due to construction activities.

B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.

C. Restoration of areas eroded due to insufficient preventive measures.

D. Performance bond.

E. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

1.2 RELATED REQUIREMENTS

A. Section 31 1000 - Site Clearing: Limits on clearing; disposition of vegetative clearing debris.

B. Section 31 2000 – Earthwork: Temporary and permanent grade changes for erosion control

C. Section 32 1123 - Aggregate Base Courses: Temporary and permanent roadways.

1.3 PERFORMANCE REQUIRMENTS

A. Comply with all requirements of U.S. Environmental Protection Agency (EPA)and Arkansas Department of Environmental Quality (ADEQ) for erosion and sedimentation control.

1. Comply with requirements and recommendations of the EPA National Pollutant Discharge Elimination System (NPDES), Phases I and II, under requirements for the 2003 Construction General Permit (CGP)
2. Comply with requirements and recommendations of the ADEQ Construction Stormwater Discharge Permit ARR150000.
3. Comply with requirements and recommendation of the ADEQ Short Term Activity Authorization Permit, Specification Section 001001.

B. Comply with requirements of State of Arkansas, Erosion and Sedimentation Control Manual.

C. Comply with requirements of the City of Wynne.

D. Develop and follow an Erosion and Sedimentation Prevention Plan and submit weekly inspection reports.

E. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.

1. Obtain and pay for permits and provide security required by authority having jurisdiction.

F. Provide to Owner a Performance Bond covering erosion and sedimentation preventive measures only, in an amount equal to 100 percent of the cost of erosion and sedimentation control work.

G. Timing: Put preventive measures in place prior to disturbance of surface cover and before precipitation occurs.

H. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.

1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.

I. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.

1. Control movement of sediment and soil from temporary stockpiles of soil.
2. Prevent development of ruts due to equipment and vehicular traffic.
3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

J. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.

1. Prevent windblown soil from leaving the project site.
2. Prevent tracking of mud onto public roads outside site.
3. Prevent mud and sediment from flowing onto sidewalks and pavements.
4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

K. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.

1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.

L. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.

1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.

M. Open Water: Prevent standing water that could become stagnant.

N. Maintenance: Maintain temporary preventative measures until permanent measures have been established.

O. All area left disturbed longer than 14 days shall be vegetated and/or stabilized.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Erosion and Sedimentation Control Plan:

1. Submit within 2 weeks after Notice to Proceed.
2. Include:

    a. Site plan identifying soils and vegetation, existing erosion problems, and areas vulnerable to erosion due to topography, soils, vegetation, or drainage.
    b. Site plan showing grading; new improvements; temporary roads, traffic accesses, and other temporary construction; and proposed preventive measures.
    c. Where extensive areas of soil will be disturbed, include storm water flow and volume calculations, soil loss predictions, and proposed preventive measures.
    d. Schedule of temporary preventive measures, in relation to ground disturbing activities.
    e. Other information required by law.
    f. Format required by law is acceptable, provided any additional information specified is also included.

3. Obtain the approval of the Plan by authorities having jurisdiction.
4. Obtain the approval of the Plan by Owner.

C. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.

D. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.

E. Maintenance Instructions: Provide instructions covering inspection and maintenance for temporary measures that must remain after Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Mulch: Use one of the following:

1. Straw or hay, certified weed seed free ‘clean’.
2. Erosion control matting or netting, bio- or photo-degradable straw, coconut, coir or jute.
3. 100% Wood Fiber Hydroseeding Mulch

B. Grass Seed for Temporary Cover: If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.

1. Summer Temporary Cover: May -September shall be Browntop Millet seeded at 100 lbs per acre and Plains Coreopsis seeded at 2 lbs per acre.
2. Winter Temporary Cover: September-May – shall be Cereal Rye -Secale cereale grain – 200 lbs/acre.

C. Stakes: One of the following, minimum 3 feet long:

1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot.
2. Wood, 2 by 2 inches in cross section.

D. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:

1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D 4751.
2. Permittivity: 0.05 sec^-1, minimum, when tested in accordance with ASTM D 4491.
3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D 4355 after 500 hours exposure.
4. Tensile Strength: 100 lb-f, minimum, in cross-machine direction; 124 lb-f, minimum, in machine direction; when tested in accordance with ASTM D 4632.
5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D 4632.
6. Tear Strength: 55 lb-f, minimum, when tested in accordance with ASTM D 4533.
7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.

E. Silt Fence Posts: One of the following, minimum 5 feet long:

1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot.

F. Gravel: See Section 32 1123 for aggregate.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.2 PREPARATION

A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.3 SCOPE OF PREVENTIVE MEASURES

A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.

B. Construction Entrances: Traffic-bearing aggregate surface.

1. Width: As required; 20 feet, minimum.
2. Length: 50 feet, minimum.
3. Provide at each construction entrance from public right-of-way.
4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.

C. Linear Sediment Barriers: Made of silt fences.

1. Provide linear sediment barriers:

a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
b. Along the toe of cut slopes and fill slopes.
c. Perpendicular to flow across the bottom of existing and new drainage channels and swales that traverse disturbed areas or carry runoff from disturbed areas; space at maximum of 200 feet apart.
d. Across the entrances to culverts that receive runoff from disturbed areas.

2. Space sediment barriers with the following maximum slope length upslope from barrier:

a. Slope of Less Than 2 Percent: 100 feet..
b. Slope Between 2 and 5 Percent: 75 feet
c. Slope Between 5 and 10 Percent: 50 feet.
d. Slope Between 10 and 20 Percent: 25 feet.
e. Slope Over 20 Percent: 15 feet.

D. Storm Drain Curb Inlet Sediment Trap: Protect each curb inlet using one of the following measures:

1. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use on piece of fabric wrapped at least 1-1/2 times around concrete blocks and secured to prevent dislodging; orient cores of blocks

so runoff passes into inlet.
2. Straw bale row blocking entire inlet face area; anchor into pavement.

E. Storm Drain Drop Inlet Sediment Traps: As detailed on drawings.

F. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.

G. Soil Stockpiles: Protect using one of the following measures:

1. Cover with polyethylene film, secured by placing soil on outer edges.
2. Cover with mulch at least 4 inches thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches of straw or hay.

H. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.

I. Temporary Seeding: Use where temporary vegetated cover is required.

3.4 INSTALLATION

A. Traffic-Bearing Aggregate Surface:

1. Excavate minimum of 6 inches.
2. Place geotextile fabric full width and length, with minimum 12 inch overlap at joints.
3. Place and compact at least 6 inches of 1.5 to 3.5 inch diameter stone.

B. Silt Fences:

1. Store and handle fabric in accordance with ASTM D 4873.
2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.
3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.
4. Where slope gradient is steeper than 3-1:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.
5. Install with top of fabric at nominal height and embedment as specified.

3.5 CLEAN UP

A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Ecological Design Group, Inc.

B. Clean out temporary sediment control structures that are to remain as permanent measures.

C. Where removal of temporary measures would leave exposed soil, shape surface

to an acceptable grade and finish to match adjacent ground surfaces.

3.6 MAINTENANCE

A. Contractor shall maintain, repair, replace or add best management practices and structural erosion and sediment controls as necessary or required to maintain project compliance with all applicable local, state and federal requirements, including Project specific Permits.

3.7 WARRANTY

A. Contractor shall warrant the project for Permit compliance for the duration of all project work or project area surface disturbance and for one year after project completion, whichever is longer.

B. Contractor shall pay for any and all fines, fees or costs incurred by the Project or Owner for non-compliance with Permit requirements.

END OF SECTION

SECTION 01 6000

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Existing Products.

B. New Products.

C. Product Options.

D. Acceptance of Specified Materials.

E. Maintenance Materials: Extra materials, spare parts, tools and software.

F. Examination of Surfaces.

G. Manufacturer’s Instructions.

H. Substitution Procedures.

I. Owner Furnished and Installed Products.

J. Transportation and Handling.

K. Storage and Protection.

L. Hazardous Material Certification.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittals.

B. Section 01 4000 - Quality Requirements: Product quality monitoring.

1.03 REFERENCE STANDARDS

A. 16 CFR 260 - Guides for the Use of Environmental Marketing Claims; Federal Trade Commission; current edition.

1.04 SUBMITTALS

A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

D. Refer to Section 01 3000 Administrative Requirements for submittal requirements.

PART 2 PRODUCTS

2.01 GENERAL

A. Material and equipment incorporated into the Work:

1. Conform to applicable specifications and standards.
2. Comply with size, make, type and quality specified, or as specifically approved in writing by the Architect.
3. Manufactured and fabricated products:
   a. Design, fabricate and assemble in accord with the best engineering and shop practices.
   b. Manufacture like parts of duplicate units to standard sizes and gauges, to be interchangeable.
   c. Two or more items of the same kind shall be identical, by the same manufacturer.
   d. Products shall be suitable for service conditions.
   e. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.
4. Do not use material or equipment for any purpose other than that for which it is designed or is specified

2.02 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by the Contract Documents.

B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.

C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

D. Reused Products: Reused products include materials and equipment previously used in this or other construction, salvaged and refurbished as specified.

2.03 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by the Contract Documents.

B. Do not use products having any of the following characteristics:
   1. Made using or containing CFC or HCFC.
   2. Made of wood from newly cut old growth timber.

2.04 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers, based on the particular product of one manufacturer: Product of listed manufacturers must be approved as meeting or exceeding the characteristics of the particular product specified.

D. Products Specified by Naming One or More Manufacturers with a provisions for Substitutions: Submit a request for substitution for any manufacturer not named.

E. Products Specified by Naming One Manufacturer Only. Use product specified, no substitutions will be allowed.

2.05 ACCEPTANCE OF SPECIFIED MATERIALS

A. Contractor and/or any Subcontractor, by entering into a contract to furnish material and/or furnish labor and material for any part of this work, agrees that the material and methods specified herein are suitable to achieve the end results required and to permit the guarantees

required, unless stated otherwise in writing to the Architect prior to execution of his Contract.

B. Though the Architect generally specifies a result rather than a method, it is considered essential to the usefulness of this specification that methods be generally outlined. No departure from results or methods specified herein will be permitted unless such permission is granted by the Architect in writing. Such permission must be obtained prior to executing each appropriate contract. If the above is not complied with, no future claims for failure because of materials, methods, etc. specified will be valid or entertained.

2.06 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections. Material shall be new and in manufacturer's original packaging when applicable.

B. Provide a list identifying total amount of each material, spare parts, tools and software.

C. Deliver and place in location as directed by the Owner; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 EXAMINATION OF SURFACES

A. Throughout this work, it will be required that certain contractors and/or subcontractors apply their material to or over work done by others, and which would affect his work. The general coordination of all such is the responsibility of the Contractor. However, it is the responsibility of each Contractor, Subcontractor or Supplier, to which it applies, to abide by the following whether or not it is specifically required, by repeating, in his particular section of these specifications.

B. Before commencing application of his Work, he shall thoroughly examine all surfaces to receive his Work and immediately notify the Architect in writing, of any imperfections in surfaces which would, in any way, affect satisfactory completion of Work. Absence of such notification shall be construed as acceptance of surfaces to receive Work. Later claims of defects in such Work will not, in any way affect guarantee of this contractor.

3.02 MANUFACTURER'S INSTRUCTIONS

A. When Contract Documents require that installation of work shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation.
   1. Maintain one set of complete instructions at the job site during installation and until completion.
   2. Handle, install, connect, clean, condition, prepare and adjust products in strict accord with such instructions and in conformity with specified requirements. Do not proceed with work without clear instructions.

3.03 SUBSTITUTION PROCEDURES

A. Architect will consider requests for substitutions only within 15 days after date established in Notice to Proceed.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

C. A request for substitution constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
   2. Will provide the same warranty for the substitution as for the specified product.
   3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.

4. Waives claims for additional costs or time extension that may subsequently become apparent.
5. Will reimburse Owner and Architect for review or redesign services associated with approval of substitutions.

D. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

E. Substitution Submittal Procedure:
1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
3. The Architect/Engineer will notify Contractor in writing of decision to accept or reject request.

3.04 OWNER FURNISHED AND INSTALLED PRODUCTS

A. Owner's Responsibilities:
1. Purchase, handle, deliver, store, set, secure or attach in place at his own expense.
2. Will not interfere with the Contractor's and/or Subcontractors' work, but the Contractor and/or Subcontractors must cooperate with this work.
3. May install this equipment before or after completion of the project by the Contractor. He will not, however, install equipment requiring connection to utilities or other contract items at such time as to require the Contractor and Subcontractor to expend overtime labor.
4. Installation or storage of these items, by the Owner in any area, does not necessarily constitute acceptance of this area.
5. Make final utility and/or ductwork connections to his equipment, test balance, etc. as required to put equipment into operation.
6. Provide shop drawings and other related literature for all equipment which will affect the Contractor's and Subcontractors' work.

B. Contractor's Responsibilities:
1. Contractor will provide space, access, electric power, water, lights, etc. to the installers of this equipment as shown on the Contract Drawings or Specifications including work as required by his appropriate Subcontractors.
2. Review Shop Drawings, Product Data, etc. as necessary with the Owner to identify discrepancies or problems anticipated in use of the Product.
3. Cooperate with Owner and/or his installer in the installation of his equipment.
4. Contractor and/or his Subcontractors as appropriate to the work required will furnish and install all electric, water, air, vacuum, waste, exhaust, vents, etc. as shown and/or specified in Contract Documents for final connection by the Owner.
5. Indicate on the Construction Schedule a line item for telephone and data wiring.

3.05 TRANSPORTATION AND HANDLING

A. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

B. Materials, products and equipment shall be properly containerized, packaged, boxed and protected to prevent damage during transportation and handling.

C. Refer to particular Section for more detailed or special handling.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.06 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

B. Store and protect products in accordance with manufacturers' instructions. Damaged goods shall not be used and shall be promptly removed from site.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.

G. Allocate available storage areas and coordinate their use with the various trades on the job.

H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

I. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

J. Prevent contact with material that may cause corrosion, discoloration, or staining.

K. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

L. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

M. Protection After Installation. Provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. Remove when no longer needed.

3.07 HAZARDOUS MATERIAL CERTIFICATION

A. All materials and/or systems used for completion of this project are to be free of asbestos and/or other hazardous materials per requirements of OSHA, EPA and all other regulatory agencies. All certification letters are to be attached to each product and included in Section 01 7000 Close Out Documents as permanent record of same.

END OF SECTION

SECTION 01 7000

CONTRACT CLOSE-OUT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Substantial Completion.

B. Final Review.

C. Reinspection Fees.

D. Final Application for Payment.

E. General Requirements.

F. Contractor Close Out Submittals to Architect.

G. Volume Format.

H. Close Out Submittal - Volume 1.

I. Final Cleaning.

J. Spare Parts and Maintenance Material.

1.02 RELATED REQUIREMENTS

A. Section 01 2000 – Price and Payment Procedures.

B. Section 01 3000 – Administrative Requirements.

C. Section 01 7200 – Project Record Documents.

D. Section 01 7250 - Project Warranties, Operation and Maintenance Data.

E. Division 21 – Fire Suppression.

F. Division 22 – Plumbing.

G. Division 23 – Mechanical.

H. Division 26 – Electrical.

I. Section 28 3111 – Digital, Addressable Fire Alarm System.

1.03 GENERAL REQUIREMENTS

A. Comply with requirements stated in the Construction Agreement in closing out the Work unless modified herein.

1.04 SUBSTANTIAL COMPLETION

A. When Contractor considers the Work is substantially complete, he shall submit to Architect:
   1. A written notice that the Work is sufficiently complete that the Owner may occupy the Work for the use for which it is intended and is therefore substantially complete.
   2. A list of items to be completed or corrected and dates scheduled for completion or correction of each item.

B. Within a reasonable time after receipt of such notice, the Architect will schedule a review to determine the status of completion. Status of completion will be judged by the entire project completion without limitation to any one phase or part of the total construction.

C Should Architect determine that the Work is not substantially complete, he will promptly notify the Contractor in writing, stating the reasons.

D Contractor shall remedy the deficiencies in the Work and send a second written notice of substantial completion to the Architect.

E Architect will review the Work again under the above Paragraph 1.04B.

F When Architect concurs that the Work is substantially complete, Architect will:
1. Prepare a Certificate of Substantial Completion on AIA Form G704 accompanied by Contractor's list of items to be completed or corrected, as verified and amended by the Architect.
2. Submit the Certificate to Owner and Contractor for their written acceptance of the responsibilities assigned to them in the Certificate of Substantial Completion.

1.05 FINAL REVIEW

A When Contractor determines the Work is complete, he shall submit to the Architect written certification that:
1. Contract Documents have been reviewed.
2. Work has been inspected by a qualified person authorized by the Contractor for compliance with Contract Documents.
3. Work has been completed in accordance with Contract Documents.
4. Equipment and systems have been tested and demonstrated in the presence of the Owner's representative and are operational.
5. Testing and Balancing of the air distribution system has been completed and 4 copies of the balancing and testing records have been submitted to the Architect for evaluation and approval. (Reference Section 01 7200, Article 1.05).
6. Inspections or letters of acceptance for items requiring approval from a governing authority.
7. Materials and/or systems used for completion of this project are free of asbestos and/or other hazardous materials per requirements of OSHA, EPA and all other regulatory agencies. All certification letters are to be attached thereto for the permanent record. (Reference Section 01 6000, Article 3.07.)
8. Work is complete and ready for final inspection.

B. Within a reasonable time after receipt of the Certification above, the Architect will schedule a review· to determine the status of completion. Status of completion will be judged by the entire project completion without limitation to any one phase or part of the total construction.

C. Should Architect consider that the Work is incomplete or defective:
1. Architect will promptly notify the Contractor in writing, listing the incomplete or defective work.
2. Contractor shall take immediate steps to remedy the stated deficiencies, and send a second written certification to Architect that the Work is complete.
3. Architect will review the Work again in accordance with Paragraph 1.04B above.

D. When the Architect finds the Work acceptable under the Contract Documents, he shall request the Contractor to submit Close Out Submittals. Refer to Article 1.10.

1.06 REINSPECTION FEES

A. Should Architect perform additional reviews due to failure of the Work to comply with the claims of status of completion made by the Contractor:
1. Owner will compensate Architect for such additional services.
2. Owner will deduct the amount of such compensation from the final payment to the Contractor.

1.07 FINAL APPLICATION FOR PAYMENT

A. Submit the Final Application for Payment accompanied by a final statement of accounting to the Architect.

B. Statement shall reflect all adjustments to the Contract Sum.
   1. The original Contract Sum.
   2. Additions and deductions resulting from:
      a. Previous Change Orders.
      b. Deductions for non-conforming work.
      c. Other adjustments as appropriate.
   3. Total Contract Sum as adjusted.
   4. Previous payments
   5. Sum remaining due

C. When the Architect determines that the Close Out Submittals are complete and correct and has received the Final Application For Payment with the Statement of Account, the Architect will prepare a Final Change Order reflecting the approved adjustments to the Contract Sum which were not previously made by Change Order, subject to Owner's approval.

1.08 CONTRACTOR'S CLOSE OUT SUBMITTALS TO ARCHITECT

A. The close out submittal shall be complete and submitted to the Architect as a single package in three (3) separate volumes. Submit one hard copy and an electronic copy:
   1. Volume 1: Legal Close Out Data - Project Close Out Data as required by Section 01 7000.
   2. Volume 2: Project Record Documents - Per requirements of Section 01 7200.
   3. Volume 3: Project Warranties, Operation and Maintenance Data - Operating and Maintenance Data, Warranties and Bonds, Instructions to Owner's Personnel - Per requirements of Section 01 7250.

1.09 VOLUME FORMAT

A. Each volume shall consist of commercial quality three ring binder with durable plastic covers. Use ring size appropriate to the amount of material to be included.

B. On face and edge of binder covers, print title of project and subject matter of binder when multiple binders are required.

C. Internally subdivide the binder contents with permanent page dividers with tab titles clearly printed under reinforced plastic tabs.

D. Contents: Prepare a Table of Contents for each volume with each item, product or system identified on white paper.

1.10 CLOSE OUT SUBMITTAL - VOLUME 1

A. Furnish two complete sets of Legal Close Out Data.

B. If two or more binders are required, identify as Volume 1A, 1B, etc.

C. Contents of this volume to include the following:
   1. Table of Contents indicating complete contents related to tab dividers.
   2. Cover sheet or sheets giving complete Project Name, Contractors and Subcontractors' Name, Address, and Telephone Number, Name of Project Superintendent, Project Manager and related general information.
   3. Consent of Surety to Final Payment, AIA Form G707.
   4. Releases of Liens from the Contractor, Subcontractors and major material suppliers, AIA Form G706A.
   5. Contractor Affidavit of Payment of Debts and Claims, AIA Form G706.
   6. Final Application for Payment, AIA Form G702 with Continuation Sheet AIA Form G703.
   7. Final Statement of Accounting.
   8. Signed Change Orders (if any).

9. Certifications.
10. Other documents related to fiscal provisions.
11. Contractor letters of Substantial Completion.
12. Architect Prepared Certificate of Substantial Completion (AIA Form G704) with Final Architectural Punch List with each item initialed by Contractor.

D. Architect will transmit one (1) copy of Volume to Owner and retain one for his records.

1.11 FINAL CLEANING

A. Execute final cleaning prior to final inspection.

B. Clean interior and exterior glass and surfaces exposed to viewso as to leave no smudges, streaks, dirt, grime, or blemishes; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Clean equipment and fixtures to a sanitary condition.

D. Clean or replace filters as required of operating equipment.

E. Clean debris from roofs, gutters, downspouts, and drainage systems.

F. Clean site; sweep paved areas; rake clean landscaped surfaces. Use a magnetic sweeper around the perimeter within 15 feet of all structures and remove any and all roof debris and fasteners.

G. Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.12 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification sections.

B. Deliver to project site and place in location as directed prior to final payment.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01 7100
EXECUTION REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Cutting and patching.

C. Surveying for laying out the work.

D. Cleaning and protection.

E. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

F. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

1.03 QUALIFICATIONS

A. For survey work for execution of the project, employ a land surveyor registered in the State of Tennessee. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

B. Civil, structural and other professional engineering services specified or required to execute Contractor’s construction methods.

1.04 COORDINATION REQUIREMENTS

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Notify affected utility companies and comply with their requirements. Identify and locate underground utilities and installations prior to commencement of the Work. Consult with Owner's archival information (if available), perform exploratory digging and employ a professional locator service for this purpose.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical, plumbing and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. Prior to fabrication or installation, submit coordination drawings for routing of mechanical, plumbing and electrical installations at a minimum 1/8 inch scale, with diagrams as required to show vertical stacking of elements below structure. Show sequence of installation of piping versus ductwork. Include electrical equipment, motors, lighting, conduits where applicable.

F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

G. Coordinate completion and clean-up of work of separate sections.

H. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

F. Utilize recognized engineering survey practices.

G. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:

1. Location of site, and confirmation, of existing survey of adjacent site structures & conditions. (Note: Contractor to locate existing multiple benchmarks located by previous surveys for owner, as well as other site structures such as buildings, bridge structures, other ongoing construction, to confirm new site layout and integration within existing campus). This information, along with confirmation & discrepancies of existing survey, to be submitted to owner.

2. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
3. Grid or axis for structures.
4. Building foundation, column locations, floor elevations.
5. Stakes for grading; topsoil placement; excavation.
6. Utility slopes and invert elevations.
7. Locations & elevations of new & existing streets, curbs & walks.
8. Building foundation, slabs, column locations and floor levels.
9. Controlling lines and levels required for the mechanical and electrical trades.
10. Partition locations within all floor plans to be located for reference for all trades.

H. Verify all grades, lines and levels and dimensions as shown on drawings.

I. Controlling lines and levels required for the mechanical and electrical trades.

J. Periodically verify layouts by same means.

K. Maintain a complete and accurate log of control and survey work as it progresses.

3.04 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.05 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. Perform whatever cutting and patching is necessary to:
1. Complete the work.
2. Fit products together to integrate with other work.
3. Provide openings for penetration of mechanical, electrical, and other services.
4. Match work that has been cut to adjacent work.
5. Repair areas adjacent to cuts to required condition.
6. Repair new work damaged by subsequent work.
7. Remove samples of installed work for testing when requested.
8. Remove and replace defective and non-conforming work.

C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

F. Restore work with new products in accordance with requirements of Contract Documents.

G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

H. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.

I. Patching:

1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
2. Match color, texture, and appearance.
3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.06 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.07 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.08 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.09 FINAL CLEANING

A. Use cleaning materials that are nonhazardous.

B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment or doors.

D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

E. Clean filters of operating equipment.

F. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, drainage systems.

G. Clean site; sweep paved areas, rake clean landscaped surfaces.

H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.10 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.

B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.

C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.

E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.

H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.11 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 01 7200

PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Record Documents.

B. "Record As-Built Drawings".

C. Close Out Submittal-Volume 2 .

1.02 RELATED REQUIREMENTS

A. Section 01 3000 – Administrative Requirements.

B. Section 01 7000 - Contract Closeout.

C. Section 01 7250 - Project Warranties, Operation and Maintenance Data.

D. Division 21 – Fire Suppression.

F. Division 22 – Plumbing.

G. Division 23 – Mechanical.

H. Division 26 – Electrical.

I. Section 28 3111 – Digital, Addressable Fire Alarm System.

1.03 RECORD DOCUMENTS

A. General:
   1. General Contractor is to maintain at the site in good condition, one complete record set of all Contract Documents for use as "Record Documents."
      a. Contract Drawings.
      b. Project Manual and Specifications.
      c. Addenda.
      d. Supplemental Drawings.
      e. Change Orders and other Modifications to the Contract.
      f. Minutes of all project meetings.
      g. Architect Field Orders or written instructions.
      h. Construction Schedules including all revisions.
      i. Approved Submittals:
         1) Shop Drawings.
         2) Product Data.
         3) Samples.
         4) Design Data.
         5) Test Reports.
         6) Manufacturer's Instructions.
         7) Manufacturer's Certificates.
         8) Applicator or Installer's Certification.
         9) Certifications.
      j. Applicator certification of substrate.
      k. Manufacturer's Field Reports.
      l. Field Test Reports (as applicable).

B. Maintenance of Documents:

1. Store Record Documents in General Contractor's field offices apart from documents used for construction. Provide secure storage space for files and racks for storage of Record Documents.
2. Maintain Record Documents in a clean, dry, legible condition and in good order. Do not use Record Documents for reference or construction use.
3. Make Record Documents available for inspection by the Architect or Owner, upon request.

C. Marking Devices:
1. Provide felt tip marking pens for recording information in the color code identified and cross-referenced to the trade required by Contract Specifications.

D. Recording:
1. Label each document "PROJECT RECORD" in neat large printed letters.
2. Record Information on a weekly basis, concurrently with construction progress. Do not "conceal" any work until required information is recorded.
   a. "Concealed" under this section is defined as not exposed after completion of construction. Concealed locations include the following: In walls (hollow or solid of all types), above ceilings (all ceilings), in floors, beneath earth, floors, etc. Record exact location, routing, and identification.
3. Drawings: Legibly mark to record actual construction:
   a. Depths of various elements of foundation in relation to finish first floor datum.
   b. Horizontal and vertical locations of underground utilities (Plumbing, Sprinkler, Mechanical and Electric) and appurtenances, referenced by dimension to permanent surface improvements.
   c. Location of internal utilities (Plumbing, Sprinkler, Mechanical and Electric) and appurtenances concealed in or above the construction, referenced to visible and accessible features of the structure including valves, tap points, junction boxes, electric wiring, test points and other related features as appropriate.
   d. Field changes of dimension and detail.
   e. Changes made by Field Order or by Change Order.
4. Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:
   a. Manufacturer's name and product model and number.
   b. Product substitutions or alternates utilized.
   c. Changes made by Addenda and Modifications.
5. Submit Record Documents as part of Close Out Submittal - Volume 2.

1.04 "RECORD AS-BUILT DRAWINGS"

A. "Record As-Built Drawings" will be required by the following Subcontractors:
1. Mechanical.
2. Plumbing.
3. Fire Protection/Sprinkler.
4. Electrical.
5. Structural.
6. Sitework and utilities.

B. Prepare "Record As-Built Drawings" to show construction as actually accomplished as recorded on "Project Record Documents". The drawings shall be prepared by the appropriate Subcontractor by using the Record Drawings corrected for appropriate new drawings.

C. "As-Built Drawings" will be required of the above listed Subcontractors and shall show as record:
1. All deviations from the sizes, locations and all other features of all installations shown by the Contract Documents.
2. Where the Contract Documents show installations in diagrammatic or schematic form the actual location will be recorded.

3. It shall be possible, using these drawings, to correctly and easily locate, identify and establish sizes of all piping, conduit, etc. and such other features of work which will be concealed by the following means:
   a. Locations of underground Work shall be established by dimensions to column lines or walls, and by properly referenced centerline or invert elevations and rates of fall.
   b. For work concealed in the building sufficient information shall be given so it can be located with reasonable accuracy and ease. This shall be by dimension wherever possible. Where this is not reasonably practical, illustrate the Work on the drawings in relation to the spaces in the building near which it was actually installed.
   c. Such other notes as required to designate size, service, etc.
4. Additional drawings shall be provided by the Subcontractor, as necessary for clarification.
5. All such drawings shall be done carefully and neatly by a competent draftsman and in a form approved by the Architect. Provide a portable digital storage device with PDF's of the "As-built" drawings and marked up record documents described in 1.0.3.D.
6. Submit "As-Built" Drawings as part of Close Out Submittal - Volume 2.

1.05 CLOSE OUT SUBMITTAL - VOLUME 2

A. Furnish one (1) complete set of Project Record Documents.

B. Volume 2 of Close Out Submittal shall be submitted along with Volume 1 and 3.

C. If two or more binders are required, identify as Volume 2A, 2B, etc.

D. Contents of this volume to be in the following format:
   1. Table of Contents indicating complete contents related to tab dividers and items separated from binders.
   2. Cover sheet or sheets giving complete Project Name, Contractor and Subcontractor's Name, Address, Telephone Numbers, Name of Project, Superintendent, Project Manager and related general information.
   3. Project Record Documents not required to be in binders. List in Table of Contents.
   4. Record "As-Built" Drawings two copies not required to be in binder. List in Table of Contents.
   5. Supplemental Drawings not required to be in binder. List in Table of Contents.
   6. Submittals:
      a. Submit one copy of each document bearing Architect's "Review for General Compliance" stamp denoted "No Exception Taken" or "Make Correction Noted."
      b. Include documents in binders where possible. List in Table of Contents those items not included in binder.
   7. Minutes of all project meetings.
   8. Color schedules.
   9. Testing laboratory "Product Test Reports".
   10. Testing and Balancing Record of Air Distribution System.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01 7250

PROJECT WARRANTIES, OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General Requirements.

B. Warranties and Bonds.

C. Materials and Finishes.

D. Equipment and Systems.

E. Close Out Submittal-Volume 3.

F. Instruction of Owner Personnel.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 – Administrative Requirements.

B. Section 01 7000 - Contract Closeout.

C. Section 01 7200 – Project Record Documents.

D. Division 21 – Fire Suppression.

E. Division 22 – Plumbing.

F. Division 23 – Mechanical.

G. Division 26 – Electrical.

H. Section 28 3111 – Digital, Addressable Fire Alarm System.

1.03 GENERAL REQUIREMENTS

A. The General Contractor, his Subcontractors and Material Suppliers, as applicable to their portion of the work, shall compile and maintain accurate Project Record Documents, Submittals (Shop Drawings, Product Data, Manufacturer's Service), Maintenance and Operation Data, Internal Wiring Diagrams and related information that the Owner may need for his use in maintenance, operation, repair, renovation or future additions to the Project and/or its equipment. Manufacturers, Suppliers, Subcontractors, Representatives, bidding the work under this Contract are advised that proprietary information on their equipment is and will be required for submittal herein. Final payment will not be made until all data is submitted in quantity and form required herein.

B. Furnish all warranties, applicator/manufacturer certifications, letters of acceptance, maintenance agreements, bonds, operation data, maintenance service data, parts list, wiring diagrams and other documents as required by this Section of Specifications.

1.04 WARRANTIES AND BONDS

A. Assemble warranties and bonds, service and maintenance contracts, executed by each of the respective manufacturers, suppliers and subcontractors, neatly typed, in orderly sequence. Provide complete information for each item.
   1. Product or work item.
   2. Firm, with name of principal, address and telephone number.
   3. Scope.
   4. Date of beginning of warranty, bond, or service and maintenance contract.
   5. Duration of warranty, bond, or service and maintenance contract.
   6. Provide information for Owner's personnel:

a. Proper procedure in case of failure.
b. Instances which might affect the validity of warranty or bond.

7. Contractor, name of responsible principal, address and telephone number.

1.05 MATERIALS AND FINISHES

A. Content, for architectural products, applied materials and finishes:
1. Manufacturer's data, giving full information on products.
a. Catalog number, size, and composition.
b. Color and texture designations.
c. Information required for reordering special manufactured products.
2. Instructions for care and maintenance:
a. Manufacturer's recommendation for types of cleaning agents and methods.
b. Cautions against cleaning agents and methods which are detrimental to the product.
c. Recommended schedule for cleaning and maintenance.

B. Content, for moisture protection and weather-exposed products:
1. Manufacturer's data, giving full information on products.
a. Applicable standards.
b. Chemical composition.
c. Details of installation.
2. Instructions for inspection, maintenance and repair.

C. Additional requirements for maintenance data: The respective sections of Specifications.

1.06 EQUIPMENT AND SYSTEMS

A. Each Item of Equipment and Each System: Include description of unit or system and component parts including all proprietary information. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data, wiring diagrams, and tests, and complete nomenclature and commercial number of replaceable parts.

B. Panelboard Circuit Directories: Provide electrical service characteristics, controls and communications.

C. Include color coded wiring diagrams as installed.

D. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down and emergency instructions. Include summer, winter and any special operating instructions.

E. Maintenance Requirements: Include routine procedures and guide for trouble-shooting; disassembly, repair, and re-assembly instructions; and alignment, adjusting, balancing and checking instructions.

F. Provide servicing and lubrication schedule, and list of lubricants required.

G. Include manufacturer's printed operation and maintenance instructions.

H. Include sequence of operation by controls manufacturer.

I. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance. Proprietary information to be included.
1. Predicted life of parts subject to wear.
2. Items recommended to be stocked as spare parts.

J. Provide control diagrams by controls manufacturer as installed.

K. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.

L. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

M. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

N. Additional Requirements: As specified in individual product specification sections.

O. Additional requirements for operating and maintenance data: Reference respective sections of Specifications.

1.07 CLOSE OUT SUBMITTAL - VOLUME 3

A. Furnish two (2) complete sets of Project Warranty, Operation and Maintenance Data.

B. Volume 3 of Close Out Submittal shall be submitted along with Volume 1 and 2 as defined in Section 01 7000 and Section 01 7200.

C. Volume 3 Format shall be prepared as per Section 01 7000. If two or more binders are required, identify as Volume 3A, 3B, etc.

D. Contents of this volume to be in the following format:
1. Table of Contents indicating complete contents. Relate to tab dividers.
2. Cover sheet or sheets giving complete Project Name, Contractor's and Subcontractors' Name, Address, Phone Number, Name of Project Superintendent, Project Manager and related general information.
3. Division 0: List Architect and Engineers complete with Name, Address, and Telephone Number.
4. Division 1A: General Warranties, Agreements and Bonds.
   a. Contractor's Certification as described in Items 1 thru 8 under Final Review in Section 01 7000 Contract Close Out, Para. 1.05A.
   b. Contractor's Warranty of Work.
5. Division 1B: Certificates and Acceptance.
   a. Certificate of Substantial Completion.
6. Division 1C: Subcontractors and Materials Suppliers.
   a. Provide a complete listing of subcontractors and materials suppliers including company name, address, phone number, contact person and local representative.
   b. Include complete product description with each subcontractor or material supplier.
7. Division 1D: Maintenance Materials.
   a. List materials and parts furnished for the Owner's use under this contract.
8. Division 2 thru 48: Technical Data:
   a. Provide warranties, agreements, maintenance service and operation manuals, and related data as required by each Section of Specifications. Furnish preprinted copies of each manufacturer's maintenance service and use instructions as required by the Specifications.
   b. Reference any oversize documents that cannot be neatly folded and bound in this binder and furnish separately with proper identification.
   c. When manufacturer's cut sheets are used for product identification, plainly mark the specific items included in this Project.

1.08 INSTRUCTION OF OWNER'S PERSONNEL

A. Prior to final inspection or acceptance, fully instruct Owner's designated operating and maintenance personnel in the operation, adjustment and maintenance of all products, equipment and systems.

B. Do not start-up or operate equipment without written consent of the Owner or his authorized agent.

C. For equipment requiring seasonal operation, perform instructions for other seasons within six months.

D. Use operation and maintenance manuals as basis for instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

E. Prepare and insert additional data in Operation and Maintenance Manual when need for such data becomes apparent during instruction.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01 7500

CLEANING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Progress Cleaning.

B. Final Cleaning.

C. Cleaning During Owner Occupancy.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Contract descriptions, description of alterations work, work by others, future work, occupancy conditions, use of site and premises, work sequence.

B. Section 01 3000 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.

C. Section 01 4000 - Quality Requirements: Procedures for testing, inspection, mock-ups, reports, certificates; use of reference standards.

D. Section 01 6000 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.

E. Section 01 7000 – Contract Closeout: Examination, preparation, and general installation procedures; preinstallation meetings; cutting and patching; cleaning and protection; starting of systems; demonstration and instruction; closeout procedures except payment procedures; requirements for alterations work.

F. Section 01 7200 – Project Record Documents: Project record documents, operation and maintenance (O&M) data, warranties and bonds.

1.03 QUALITY ASSURANCE

A. Throughout the construction period, maintain the buildings and site in a standard of cleanliness as described in this Section.

B. Conduct daily inspection, and more often if necessary, to verify that requirements for cleanliness are being met.

C. In addition to the standards described in this Section, comply with pertinent requirements of governmental agencies having jurisdiction.

PART 2 PRODUCTS

2.01 CLEANING MATERIALS AND EQUIPMENT

A. Provide required personnel, equipment and materials needed to maintain the specified standard of cleanliness.

2.02 COMPATIBILITY

A. Use only the cleaning materials and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the material.

PART 3 EXECUTION

3.01 PROGRESS CLEANING

A. General:
   1. Retain stored items in an orderly arrangement allowing maximum access, not impeding traffic or drainage and providing required protection of materials.
   2. Do not allow accumulation of scrap, debris, waste material and other items not required for construction of this Work.
   3. At least twice each month, and more often if necessary, completely remove all scrap, debris and waste material from the job site.
   4. Provide adequate storage for all items awaiting removal from the job site, observing requirements for fire protection and protection of the ecology.

B. Site:
   1. Daily, and more often if necessary, inspect the site and pick up all scrap, debris and waste material. Remove such items to the place designated for their storage.
   2. Weekly, and more often if necessary, inspect all arrangements of materials stored on the site. Re-stack, tidy or otherwise service arrangements to meet the requirements of subparagraph 3.01.A.1 above.
   3. Always maintain the site in a neat and orderly condition.

C. Structures:
   1. Weekly, and more often if necessary, inspect the structures and pick up all scrap, debris and waste material. Remove such items to the place designated for their storage.
   2. Weekly, and more often if necessary, sweep interior spaces clean. "Clean", for the purpose of this subparagraph, shall be interpreted as meaning free from dust and other material capable of being removed by use of reasonable effort and hand-held broom.
   3. As required preparatory to installation of succeeding materials, clean the structures of pertinent portions thereof to the degree of cleanliness recommended by the manufacturer of the succeeding material, using equipment and materials required to achieve the necessary cleanliness.
   4. Following the installation of finish floor materials, clean the finish floor daily (and more often, if necessary) at all times while work is being performed in the space in which finish materials are being installed. "Clean", for the purpose of this subparagraph, shall be interpreted as meaning free from foreign material which, in the opinion of the Architect, may be injurious to the finish floor.

3.02 FINAL CLEANING:

A. Complete prior to final inspection:
   1. "Clean", for the purpose of this Article, and except as may be specifically provided otherwise, shall be interpreted as meaning the level of cleanliness generally provided by skilled cleaners using commercial quality building maintenance equipment and materials.
   2. Prior to completion of the Work, remove from the job site all tools, surplus materials, equipment, scrap, debris and waste. Conduct final progress cleaning as described in Article 3.01 above.
   3. Site: Unless otherwise specifically directed by the Architect, broom clean paved areas on the site and public paved areas adjacent to the site. Completely remove resultant debris.
   4. Exterior: Visually inspect exterior surfaces and remove all traces of soil, waste materials, smudges and other foreign matter. Remove all traces of splashed materials from adjacent surfaces. If necessary to achieve a uniform degree of cleanliness, hose down the exterior of the structure. In the event of stubborn stains not removable with water, the Architect may require light sandblasting or other cleaning at no additional cost to the Owner.
   5. Interior: Visually inspect interior surfaces and remove all traces of soil, waste materials, smudges, labels, and other foreign matter. Clean all interior finishes including gypsum wall board, flooring, carpets, wall coverings, ceilings, etc. Remove all traces of splashed

materials from adjacent surfaces. Remove paint droppings, spots, stains and dirt from finished surfaces. Clean interior surfaces exposed to view; remove temporary labels, stains and foreign substances, clean equipment and fixtures to a sanitary condition, clean or replace all filters in mechanical equipment.

6. Glass: Thoroughly clean glass and aluminum materials of smudges, temporary labels, dust, dirt and grime.
7. Polished Surfaces: To surfaces requiring routine application of buffed polish, apply the polish recommended by the manufacturer of the material being polished.
8. If final cleaning is not acceptable to the Owner or Architect, the Contractor shall re-clean the unacceptable areas, equipment and finishes at no additional cost to the Owner..
9. Final "Final" Cleaning: Contractor is responsible for re-cleaning areas where correction of punch list items have resulted in the creation of debris, scrap material, dirt, dust, etc. at no additional cost to the Owner.

3.03 CLEANING DURING OWNER'S OCCUPANCY

A. Should the Owner occupy the Work or any portion thereof prior to its completion by the Contractor and acceptance by the Owner, responsibilities for interim and final cleaning shall be as determined by the Architect In accordance with the General Conditions of the Contract.

END OF SECTION

GEOTECHNICAL EXPLORATION
WYNNE HIGH SCHOOL
NEW CAMPUS
WYNNE, ARKANSAS

Prepared for:

ARCH 1010
MEMPHIS, TENNESSEE

Prepared by:

GEOTECHNOLOGY, LLC, DBA UES
MEMPHIS, TENNESSEE

Date:

APRIL 11, 2024

Project No.:

J043641.01

SAFETY
TEAMWORK
RESPONSIVENESS
INTEGRITY
VALUE
EXCELLENCE

Environmental
Geotechnical Engineering
Materials Testing
Field Inspections & Code Compliance
Geophysical Technology

April 11, 2024

Mr. Waylon W. Reed, NCARB
Director of Architecture
ARCH 1010
1378 Union Avenue, Suite 0101
Memphis, Tennessee 38104

Re: Geotechnical Exploration
Wynne High School New Campus
Wynne, Arkansas
Project No. J043641.01

Dear Mr. Reed:

Presented in this report are the results of the geotechnical exploration performed by Geotechnology, LLC, dba UES for the referenced project in Wynne, Arkansas. The report includes our understanding of the project, observed site conditions, conclusions and/or recommendations, and support data as listed in the Table of Contents.

We appreciate the opportunity to provide geotechnical services for this project. If you have any questions regarding this report, or if we can be of any additional service to you, please do not hesitate to contact us.

Respectfully submitted,

UES

STATE OF ARKANSAS REGISTERED PROFESSIONAL ENGINEER No. 10815 ASHRAF S. ELSAYED

Ashraf Elsayed, Ph.D., P.E., D.GE
Chief Engineer – Midwest Region

Jacob Monroe, P.E.
Project Engineer

JDM/ASE:jdm

Copies submitted: Client (email)

TABLE OF CONTENTS

1.0 Introduction 1
2.0 Site Description 1
3.0 Project Information 2
4.0 Geotechnical Exploration 2
5.0 Laboratory Review and Testing 3
6.0 Subsurface Conditions 3
6.1 Stratigraphy 3
6.1.1 Predominately Coarse-Grained Soils 4
6.1.2 Predominately Fine-Grained Soils 4
6.2 Groundwater 4
7.0 Conclusions and Recommendations 4
7.1 Geotechnical Concerns 4
7.1.1 General Geotechnical Concerns and Recommendations 4
7.1.2 Soft Soil Concerns 5
7.1.3 High Plasticity Clay Concerns 6
7.2 Site Preparation and Earthwork 6
7.2.1 Site Preparation 6
7.2.2 Proof-Roll 6
7.2.3 Cut Areas 7
7.2.4 Fill Materials, Placement, and Compaction 7
7.2.5 Site Water Management 8
7.2.6 Additional Earthwork Considerations 8
7.3 2021 IBC/ASCE 7-16 Seismic Site Classification and Seismic Design Parameters 8
7.4 Liquefaction and Lateral Spread Potential 9
7.5 Shallow Foundations 10
7.5.1 Main Campus Structure 10
7.5.2 Locker Faculty Structure 11
7.5.3 Shallow Foundation Construction Considerations 11
7.6 Ground Improvement – Main Campus Structure 12
7.7 Augercast Piles – Main Campus Structure 12
7.7.1 Uplift Resistance 13
7.7.2 ACP Pile Groups 13
7.7.3 ACP Construction Considerations 13
7.7.4 ACP Static Load Testing 14
7.7.5 ACP Foundation Settlement 14
7.7.6 ACP Lateral Load Analyses 14
7.8 Floor Slabs 14
7.9 Pavements 15
7.9.1 Flexible Pavements 16
7.9.2 Rigid Pavements 17
7.10 Utility Construction 19
8.0 Recommended Additional Services 19
9.0 Limitations 20

Appendices

- Appendix A – Important Information About This Geotechnical-Engineering Report
- Appendix B – Figures
- Appendix C – Boring Information
- Appendix D – Laboratory Test Data

LIST OF TABLES

Table 1. Boring Locations, Designations, and Depths. 2
Table 2. Percent Compaction and Moisture-Conditioning Requirements for Fill and Backfill. 7
Table 3. Relative Density Compaction Requirements for Granular Fill and Backfill. 8
Table 4. Site Class and Seismic Parameters (2% Probability of Exceedance in 50 Years). 9
Table 5. Shallow Foundation Settlement Analyses. 10
Table 6. Recommended Axial Capacities – ACP 13
Table 7. Assumed AASHTO Flexible Pavement Design Parameters. 16
Table 8. Flexible Pavement Thickness Recommendations 17
Table 9. Assumed AASHTO Rigid Pavement Design Parameters 18
Table 10. Rigid Pavement Thickness Recommendations. 18

GEOTECHNICAL EXPLORATION
WYNNE HIGH SCHOOL NEW CAMPUS
WYNNE, ARKANSAS
April 11, 2024 | Project No. J043641.01

1.0 INTRODUCTION

UES has prepared this geotechnical exploration report for the proposed new Wynne High School campus to be located in Wynne, Arkansas. Our scope of services documented in this report were provided in general accordance with the scope of services described in our Proposal P043641.01, dated May 23, 2023. Our services were authorized by your signed acceptance on December 8, 2023.

The purposes of the geotechnical exploration were to develop a general subsurface profile at the site and prepare recommendations for the geotechnical aspects of the design and construction of the project as defined in our proposal. Our scope of services included site reconnaissance, geotechnical borings, laboratory testing, engineering analyses, and preparation of this report. Unless noted otherwise, all dimensions, measurements, depths, and locations in this report should be considered approximate.

A copy of "Important Information about This Geotechnical-Engineering Report", published by the Geotechnical Business Council of the Geoprofessional Business Association, is included in Appendix A for your review. The publication discusses report limitations and ways to manage risk associated with subsurface conditions.

2.0 SITE DESCRIPTION

The existing Wynne High School campus was located at 800 East Jackson Avenue in Wynne, Arkansas. Most of the previous buildings were destroyed by a tornado, and the remainder of the previous campus consists of concrete slabs, sidewalks, an athletic field to the east, and various parking and drive areas. Some existing buildings to the north of the previous campus remain in place. The proposed area of development, herein referred to as the site, is located in the vicinity of the previous campus. The project location is shown on Figure 1 (Site Location and Topography) in Appendix B. The site is bordered to the north by residences and East Bridges Avenue, to the east by North Lemons Street, to the south by East Jackson Avenue, and to the west by commercial development and Falls Boulevard (also referred to as AR-1).

3.0 PROJECT INFORMATION

Based on review of the provided preliminary architectural site plan[1], the project includes the design of a new high school campus in the vicinity of the previous campus. Based on review of the provided plans, the proposed new campus will be a two-story structure in most of the footprint areas and a three-story structure in the southern portion. The reported total square footage of the proposed campus is approximately ±129,391 square feet (sf), with an approximate footprint of 73,000 sf. Associated parking and drive areas are planned for north, west, and south of the proposed campus, and a new locker faculty building is planned in between existing buildings on the northern portion of the site. The proposed locker faculty structure will have a footprint of approximately 7,000 sf. Grading information was not provided; however, we have assumed a maximum grade change of less than 3 feet. Loading information provided by the client include maximum anticipated column and wall loads of 300 kips and 7.5 kips per linear foot (klf), respectively, for the main campus structure. Loading information for the locker faculty building was not provided, and we have assumed maximum column and wall loads of 100 kips and 4 klf.

4.0 GEOTECHNICAL EXPLORATION

The geotechnical exploration consisted of 20 borings. Locations, designations, and depth ranges of borings are presented in Table 1.

Table 1. Boring Locations, Designations, and Depths.

Location	Boring Designations	Boring Depths (feet)
New High School Campus	B-1 through -14	25 – 50
Locker Faculty Building	B-15	25
Parking and Drive Areas	P-1 through -5	5

The borings were located in the field by a UES representative. The boring locations shown on Figure 2 (Aerial Photograph of Site and Boring Locations) in Appendix B are approximate; if elevations or more precise locations are required, the client should retain a registered surveyor to establish boring locations and elevations.

The borings were drilled on February 26 through 29 and March 5, 2024, using an ATV-mounted rotary drill rig (CME 750X). Hollow-stem auger drilling methods were used as indicated on the boring logs presented in Appendix C. Sampling of the soils was accomplished ahead of the augers at the depths indicated on the boring logs, using 2-inch-outside-diameter (O.D.) split-spoons and 3-inch-O.D., thin-walled Shelby tube samplers in general accordance with the procedures outlined by ASTM D1586 and ASTM D1587, respectively. Standard Penetration Tests

[1] *Architecture Site Plan, WSD – New Senior High School*. Developed by ARCH 1010, dated February 9, 2024.

(SPTs) were performed using an automatic hammer to obtain the standard penetration resistance, or N-value[2], of the sampled material.

The drill crew recorded the subsurface profile noting the soil types and stratifications, groundwater, SPT results, and other pertinent data. Observations for groundwater were made in the borings during drilling.

Representative portions of the split-spoon samples were placed in glass jars to preserve sample moisture. The Shelby tubes were capped and taped at their ends to preserve sample moisture and unit weight, and the tubes were transported and stored in an upright position. The glass jars and Shelby tubes were marked and labeled in the field for identification, then returned to our laboratory in Memphis.

5.0 LABORATORY REVIEW AND TESTING

Laboratory testing was performed on soil samples to assess engineering and index properties. The soil testing consisted of moisture contents (ASTM D2216), Atterberg limits (ASTM D4318), percent of soil finer than No. 200 sieve (ASTM D1140), and unconsolidated-undrained triaxial compression (UU; ASTM D2850). The laboratory test results are presented on the boring logs in Appendix C. The Atterberg limit and UU test results are also provided in Appendix D.

The boring logs were prepared by a geotechnical engineer from the field logs, visual classifications of the soil samples in the laboratory, and laboratory test results. Terms and symbols used on the boring logs are presented in the Boring Log: Terms and Symbols in Appendix C. Stratification lines on the boring logs indicate approximate changes in strata. The transition between strata could be abrupt or gradual.

6.0 SUBSURFACE CONDITIONS

6.1 Stratigraphy

The ground surface at the boring locations generally consisted of topsoil ranging in thickness from 1 to 4 inches, 3 inches of concrete (cored by others to facilitate drilling), or 2 inches of asphalt pavement overlying clayey, sandy, and gravelly base material of varying thickness. Please refer to the boring logs in Appendix C for more descriptions of the surficial materials. Below the surficial material, the soil stratigraphy at the site generally consisted of predominately fine-grained soils extending to the maximum depth of exploration (50 feet) in most borings. In Borings B-6 and -10, predominately coarse-grained soils were encountered below the surficial materials and extended

[2] The standard penetration resistance, or N-value, is defined as the number of blows required to drive the split-spoon sampler 12 inches with a 140-pound hammer falling 30 inches. Since the split-spoon sampler is driven 18 inches or until refusal, the blows for the first 6 inches are for seating the sampler, and the number of blows for the final 12 inches is the N-value. Additionally, “refusal” of the split-spoon sampler occurs when the sampler is driven less than 6 inches with 50 blows of the hammer.

to depths of approximately 3.5 feet. More specific descriptions of the soil layers are provided below and on the boring logs in Appendix C.

6.1.1 Predominately Coarse-Grained Soils

Soils classified as clayey sand (SC) were encountered below the surficial materials at Borings B-6 and -10 and extended to depths of 3.5 feet. SPT N-values measured in the coarse-grained soils were 10 and 11 blows per foot (bpf), indicative of loose and medium dense conditions, respectively.

6.1.2 Predominately Fine-Grained Soils

Predominantly fine-grained soils classified as low plasticity “lean” clay (CL), clayey silt (ML) and high plasticity “fat” clay (CH) were encountered below the surficial materials and upper, coarse-grained soils in the borings and extending to the boring termination depths. Moisture contents of the tested samples ranged from 13 to 38 percent. Atterberg limits performed on select sample yielded liquid limits (LL) of 32 to 60 percent and plasticity indices (PI) of 9 to 35 percent. UU tests performed on relatively undisturbed Shelby tube samples yielded undrained shear strengths of 835 to 1,865 pounds per square foot (psf), indicative of medium stiff to stiff consistencies. SPT N-values measured in the fine-grained soils ranged from 1 to 26 blows per foot (bpf), which in our experience is indicative of very soft to very stiff consistencies.

6.2 Groundwater

Groundwater was not encountered in the borings during drilling operations. Groundwater levels will vary over time due to seasonal variations in precipitation or other factors not evident at the time of exploration.

7.0 CONCLUSIONS AND RECOMMENDATIONS

UES has prepared the following conclusions and recommendations based on our understanding of the proposed project, the field and laboratory data presented in this report, engineering analyses, and our experience and judgment. UES should be allowed to review final grading and foundation plans to verify that our recommendations have been properly implemented and are suitable for the final design.

7.1 Geotechnical Concerns

7.1.1 General Geotechnical Concerns and Recommendations

The following sections outline geotechnical concerns that could influence project budget and schedule. Geotechnical concerns for the site generally consist of soft, relatively wet and moisture-sensitive soils and high plasticity clays encountered in the upper 10 feet.

Low plasticity clay and silt soils can quickly diminish in strength if disturbed and/or wet, resulting in softening of the soil subgrade below foundations, pavements, and floor slabs. Reducing construction disturbance is suggested as a means of lowering the potential for subgrade softening. Construction traffic should be restricted to specific areas to mitigate subgrade disturbance. Positive drainage should be maintained during grading operations. During grading,

lime and/or mechanical aeration techniques may be used to lower high moisture contents. Foundation excavations should be observed and probed by the geotechnical engineer or their representative and wet or soft soils encountered be over-excavated and backfilled as indicated subsequently in this report.

In general, we recommend test pits be performed in the areas where soft soils and high plasticity clays were encountered to determine their depths and extents in the areas of proposed structures and pavements. Further recommendations for test pits and remediation of soft and high plasticity soils are provided subsequently. The geotechnical engineer or their representative should be present for the test pit observations. Additional recommendations may be required based on the results of the test pit observations.

Contractors should consider the timing of construction relative to the time of year and weather in their estimates. If construction is performed during relatively cold and wet weather, lime- or cement-treatment of the subgrade could be beneficial to maintain progress during construction. Otherwise, the subgrade could be weakened by softening from saturation by rain and/or snow, leading to delays in reworking the subgrade to prepare it back to its pre-softened condition.

7.1.2 Soft Soil Concerns

Soft, relatively wet soils were encountered in the upper 10 feet of Borings B-1, -2, -4, -7, and -12 in the footprint of the proposed main campus structure. Such soils were not encountered in the footprint of the proposed locker faculty structure; however, these soils may extend to other areas and depths across the site. Structures supported on such soils could be damaged due to the effects of excessive total or differential settlement as a result of disturbance. Over-excavation and replacement of these soils may be required to create a stable platform for construction and to mitigate settlement of the new campus structure. The over-excavated soils should be replaced with suitable fill material and be placed as recommended in Section 7.2 of this report. The soft, relatively wet soils removed during over-excavation should be dried using mechanical methods or mixing the soils with lime if they are to be reused as fill material.

In areas where soft soils are encountered in the test pit excavations, we recommend the soft soils be over-excavated and replaced with suitable fill a minimum of 3 feet below the base of footings and 2 feet below the base of floor slabs and pavements. In general, we recommend undercutting and replacement of soft soils extend a minimum of 5 feet beyond the footprint of the proposed structure. However, the actual depth and extent of the soil replacement will be based on the findings of the test pits at the time of construction. We recommend foundation excavation and over-excavation operations be observed by the geotechnical engineer or their representative.

In lieu of over-excavation and replacement of the soft soils, ground improvement systems, such as aggregate piers, may be used to facilitate shallow foundation support of the proposed new campus structure. Additionally, deep foundations may be considered for support of the proposed new campus structure. Further recommendations for ground improvement and deep foundations are provided subsequently in Sections 7.6 and 7.7, respectively, of this report.

7.1.3 High Plasticity Clay Concerns

High plasticity “fat” clays were encountered in Borings B-4 and -5 extending from approximately 6 to 8.5 feet and 3 to 6 feet, respectively, below existing grade. High plasticity clays may be encountered at other areas and depths across the site. Fat clays are potentially expansive with changes in moisture content. Foundations, floor slabs, and pavements supported on high plasticity, potentially expansive soils within the drying/wetting zone can undergo distress as the soil shrinks or swells unless these soils are mitigated.

In general, we recommend the bottoms of floor slabs and footings and the base material under new pavement structures be separated from fat clays with a buffer zone. The buffer zone should consist of suitable fill material and be placed as recommended in Section 7.2 of this report. The buffer zone should extend a minimum of 3 feet below the bottoms of floor slabs and footings and a minimum of 2 feet below pavement base materials. In general, we recommend undercutting and replacement of high plasticity clays extend a minimum of 5 feet beyond the footprint of the proposed structure. The construction of the buffer zone may require filling, undercutting and backfilling, lime-treatment, or a combination thereof. The geotechnical engineer or their representative should be onsite during test pit excavations, grading operations, and foundation excavations to assess the soil types at the bottom of excavations for potential high plasticity clays and determine if additional excavation is necessary.

The proposed method of fat clay remediation are based on generally accepted standards in the local engineering community. Clay properties, including plasticity, moisture content, unit weight, swell pressure, and mineralogy are variable and could, in some circumstances, be conducive to more severe swell pressures and volume change potential than can be mitigated by nominal treatment. Consequently, when building in an area where fat clays are present, the client should realize there is an inherent risk that damage associated with shrink or swell of the soil could occur, even with remedial treatment of the subgrade soils.

7.2 Site Preparation and Earthwork

We have assumed up to 3 feet of grade change will be required to achieve design grades at the site. The following paragraphs outline grading recommendations for the site.

7.2.1 Site Preparation

We understand slabs and foundations from the previous school have been demolished and removed from the site. In general, cut areas and areas to receive new fill should be stripped of topsoil, soft soils, and other deleterious materials. Topsoil should be placed in landscape areas or disposed of off-site. Vegetation and tree root-balls, if present, should be over-excavated. Contractors should account for the removal of existing utilities and vegetation in their estimates.

7.2.2 Proof-Roll

The exposed subgrade should be proof-rolled with a tandem axle dump truck loaded to approximately 20 kips per axle (or equivalent proof-rolling equipment). The proof-rolling equipment should traverse the exposed subgrade with overlapping passes of the vehicle.

Soft areas or pumping subgrade that develop during proof-rolling should be over-excavated and backfilled with soil compacted to the densities specified subsequently in this report prior to placement of fill or continued construction. The geotechnical engineer or their representative should be onsite to observe proof-roll operations and make recommendations for improvement.

7.2.3 Cut Areas

After excavation, the top 6 inches of the resulting subgrade should be compacted to a minimum of 98% of the maximum dry unit weight as determined by a standard Proctor test (ASTM D698).

7.2.4 Fill Materials, Placement, and Compaction

Fill material should consist of natural soils classifying as silt, lean clay, silty sand, or clayey sand (ML, CL, SM, or SC), have a maximum LL of 45 and a PI of no more than 20. Such materials should be free from organic matter, debris, or other deleterious materials, and have a maximum particle size of 2 inches.

Fill and backfill should be placed in level lifts, up to 8 inches in loose thickness. For soils that exhibit a well-defined moisture density relationship, each lift should be moisture-conditioned to within the acceptable moisture content range provided in Table 2, and compacted to at least the minimum percent compaction indicated in Table 2. Moisture-conditioning can include: aeration and drying of wetter soils; wetting drier soils; and/or mixing wetter and drier soils into a uniform blend. For granular soils that do not exhibit a well-defined moisture density relationship, the soils should be compacted to at least the minimum relative densities indicated in Table 3. Thinner lifts should be used for lighter compaction equipment.

Table 2. Percent Compaction and Moisture-Conditioning Requirements for Fill and Backfill.

Area	Minimum Percent Compaction[a,b]	Acceptable Moisture Content Range[c]
Structural[d]	95%	±2%
Non-structural	92%	±2%
Pavement subgrades	98%	±2%

[a] In reference to the standard Proctor maximum dry unit weight measured by ASTM D698.
[b] For granular soils that do not exhibit a well-defined moisture-density relationship, refer to Table 3 for minimum relative density requirements.
[c] In reference to optimum moisture content as measured by ASTM D698.
[d] Structural fill and backfill for foundations are defined as fill and backfill located within the zones of influence of structures. The zone of influence of a structure is defined as the area below the footprint of the structure and 1V:1H outward and downward projections from the bearing elevation of the structure.

Table 3. Relative Density Compaction Requirements for Granular Fill and Backfill.

Area	Minimum Relative Density[a,b]
Structural[c]	70%
Non-Structural	70%
Pavement Subgrades	75%

[a] Relative density evaluated from the maximum and minimum index densities measured by ASTM D4253 and D4254, respectively.
[b] For granular soils that exhibit a well-defined moisture density relationship, refer to Table 2 for minimum percent compaction and moisture-conditioning requirements.
[c] Structural fill and backfill for foundations are defined as fill and backfill located within the zones of influence of structures. The zone of influence of a structure is defined as the area below the footprint of the structure and 1V:1H outward and downward projections from the bearing elevation of the structure.

7.2.5 Site Water Management

Managing site water is important in successful performance of the pavement and foundation systems. Water from surface runoff, downspouts, and subsurface drains should be collected and discharged through a storm water collection system. Positive drainage should be established around the proposed structures to promote drainage of surface water away from the structures and reduce ponding of water adjacent to these structures.

Maintaining the moisture content of bearing and subgrade soils within the acceptable range provided in Table 2 is important during and after construction for the proposed structures. Silty and clayey bearing and subgrade soils should not be allowed to become wet or dry during or after construction, and measures should be taken to hinder water from ponding on these soils and to reduce drying of these soils.

7.2.6 Additional Earthwork Considerations

Trees and other deep-rooted vegetation should not be planted within 1.5 times their projected mature foliage radius from foundations, as the roots extract moisture from plastic and low-plastic soils alike, causing them to shrink, which can potentially result in foundation settlement. Shrubs and flowerbeds should be located a minimum of 5 feet away from the perimeter of foundations.

Asphalt, concrete, or fill should not be placed over frozen or saturated soils, and frozen or saturated soils should not be used as compacted fill or backfill. Upon completion of earthwork, disturbed areas should be stabilized.

7.3 2021 IBC/ASCE 7-16 Seismic Site Classification and Seismic Design Parameters

The site lies within the influence of the New Madrid Seismic Zone (NMSZ). It is our understanding the proposed construction will be designed in accordance with the 2021 International Building Code (IBC) and Chapter 20 of the ASCE 7-16. The 2021 IBC/ASCE 7-16 stipulates structures be designed based on an earthquake event with a probability of exceedance of 2% in 50 years. Based on the results of the field and laboratory testing, our experience in the vicinity, and our interpretation of the 2021 IBC/ASCE 7-16, it is our opinion the site class and seismic parameters in Table 4 are applicable for this project.

Table 4. Site Class and Seismic Parameters (2% Probability of Exceedance in 50 Years).

Category/ Parameter	Designation/ Value	Reference
S_S	1.135g[a]	Latitude 35.229288°N / Longitude 90.782595°W
S_1	0.396g[a]	
Seismic Site Class	D	Chapter 20 of ASCE 7-16
F_a	1.046	2021 IBC Table 1613.2.3(1)
F_v	--[b]	2021 IBC Table 1613.2.3(2)
F_{PGA}	1.100	ASCE 7-16 Table 11.8-1
S_{MS}	1.187g	2021 IBC Equation 16-20
S_{M1}	--[b]	2021 IBC Equation 16-21
S_{DS}	0.792g	2021 IBC Equation 16-22
S_{D1}	--[b]	2021 IBC Equation 16-23
PGA	0.689g	ASCE 7-16 Figure 22-7
PGA_M	0.758g	ASCE 7-16 Equation 11.8-1

[a] S_S and S_1 were computed using the web-based U.S. Seismic Design Maps (https://ascehazardtool.org) using the indicated latitude and longitude coordinates of the project site.
[b] Refer to ASCE 7-16 Section 11.4.8 exception for the Site Class D and mapped $S_1 > 0.2g$.

Based on Section 11.4.8 of the ASCE 7-16, a site-specific hazard analysis shall be performed for the subject site to determine values for F_V, S_{M1}, and S_{D1}, among other site-specific seismic design values, unless the relevant exception described therein is used to increase the seismic loading for structural design. Should this exception be utilized, the following values may be used:

$F_V = 1.904$
$S_{M1} = 0.754g$
$S_{D1} = 0.503g$

If a site-specific seismic hazard analysis is desired, please contact UES.

7.4 Liquefaction and Lateral Spread Potential

Liquefaction can occur in loose, saturated, cohesionless soil deposits subjected to earthquake motions. Based on the soil and groundwater conditions encountered in the borings, it is our professional opinion that liquefaction potential in the upper 50 feet at the site is considered to be low. Note that some movement of foundations should be anticipated during seismic events, and dynamic settlements can occur regardless of the occurrence of liquefaction.

Lateral spreading is triggered and sustained by earthquake ground motions. Based on the results of the liquefaction analyses, it is our professional opinion that the potential for lateral spreading is low at the site.

7.5 Shallow Foundations

The following shallow foundation recommendations are provided for the main campus structure and the proposed locker faculty structure. The shallow foundation recommendations provided in the following sections are exclusive to the respective structure being discussed. Construction recommendations for shallow foundations are provided subsequently.

7.5.1 Main Campus Structure

The following shallow foundation recommendations are exclusive to the area of the proposed main campus structure. Loading information provided by the client include anticipated maximum column and wall loads of 300 kips and 7.5 kips per linear foot (klf). However, we understand the provided maximum loading will only occur in a portion of the structure, and the anticipated maximum loading in other areas of the site may be lower.

Presented in Table 5 are results of settlement analyses performed for shallow foundations in the area of the proposed main campus structure. As requested, a range of column loads were considered for the settlement analyses. Settlement analyses were performed for the various column loads to estimate the maximum net allowable bearing capacity to achieve 1 inch and ¾ inch of total and differential settlement, respectively. Additionally, settlement analyses were performed for a maximum net allowable bearing capacity of 2,500 pounds per square foot to estimate associated total and differential settlement. The associated contact pressure and approximate footing size for the considered column loads are provided in the table. The analyses were based on the site is prepared as recommended in Sections 7.1 and 7.2 of this report.

Table 5. Shallow Foundation Settlement Analyses.

Column Load	Contact Pressure (psf)	Approximate Spread Footing Size (feet)	Estimated Settlement (inches)	
			Total	Differential
100 kips	2,500	6.5 x 6.5	1	¾
150 kips	2,100	8.5 x 8.5	1	¾
	2,500	8 x 8	1¼	¾
200 kips	1,800	10.5 x 10.5	1	¾
	2,500	9 x 9	1¼	¾
300 kips	1,500	14 x 14	1	¾
	2,500	11 x 11	1½	1

The provided recommendations for the main campus structure are based on the over-excavation and replacement of soft, wet soils encountered during test pit excavations a minimum of 3 feet below the base of shallow foundations as discussed in Section 7.1.2 of this report. Additionally, high plasticity clays were encountered in Boring B-4 and -5 at approximate depths of 3 to 6 feet below existing ground surface and may be present in other areas of the site. We recommend test

pit excavations be performed in the areas where high plasticity clays were encountered. High plasticity clays encountered during test pit excavations should be over-excavated and replaced with a buffer zone a minimum of 3 feet below foundations as discussed in Section 7.1.3 of this report.

7.5.2 Locker Faculty Structure

The following shallow foundation recommendations are exclusive to the area of the proposed locker faculty structure. Based on the soils encountered in the footprint of the proposed structure, undercut and replacement of in-situ soft, relatively wet soils may not be required. However, we recommend foundation excavations be observed by the geotechnical engineer or their representative and, if encountered, soft, wet soils be remediated as discussed previously. Loading information was not provided; the following shallow foundation recommendations are based on assumed maximum column and wall loads of 100 kips and 4 klf, respectively.

Provided the area of the proposed locker faculty structure is prepared as recommended in Section 7.2 of this report, shallow foundations can be proportioned using a maximum net allowable bearing pressure of 2,500 and 2,200 pounds per square foot (psf), for spread and strip footings, respectively. Total and differential settlement of shallow foundations are anticipated to be 1 inch and ¾ of an inch, respectively.

Based on review of the provided site plan, the proposed locker faculty structure will be constructed between two existing structures. The proposed new structure should be designed such that new loads are not transferred onto existing adjacent or nearby foundations. Existing adjacent and nearby foundations should not be undermined during construction of the new structure and should be protected through means of shoring or other methods during excavations and construction.

7.5.3 Shallow Foundation Construction Considerations

The provided shallow foundation recommendations are based on the conditions that foundation plans are forwarded to UES for review and the foundation excavations are observed by the geotechnical engineer or their representative. Additional recommendations may be required based on the results of the foundation observations.

Footing excavations should be made with a smooth-edged backhoe bucket, and foot traffic in the bottom of the excavation should be minimized. Footing excavations should be extended through deleterious materials and/or zones of soft soil, if encountered; the over-excavations can be backfilled with compacted fill, lean concrete, or flowable fill.

For exterior footings, we recommend that the footings bear a minimum of 18 inches below finish grade. An additional 6 inches of embedment is recommended if the erosion of the cover material is not controlled. Drainage should be maintained away from the foundations throughout the life of the structure. Water should never be allowed to pond against the footings.

7.6 Ground Improvement – Main Campus Structure

If the provided maximum net allowable bearing pressure is not sufficient, or if the estimated settlement values are considered excessive, ground improvement methods may be used to facilitate use of shallow foundations. Additionally, ground improvement methods may be used in lieu of undercutting and replacement of soft, wet soils as discussed in Section 7.1.2 if this report. Ground improvement systems may include, but are not limited to, aggregate piers (AP), rigid inclusions, or other proprietary systems. Such systems are typically designed and installed by specialty design/build contractors using data from this report and specific loads and layouts for the structures.

Installation of AP systems increases the lateral stress in surrounding soil, thereby further stiffening the stabilized composite soil mass. The results of the AP or other systems is a strengthening and stiffening of subsurface soils that then support structural loads. Typically, a net allowable bearing pressure of 4,000 to 6,000 pounds per square foot (psf) can be achieved where AP or other proprietary systems are used.

7.7 Augercast Piles – Main Campus Structure

In lieu of undercut and replacement of in-situ soft soils and high plasticity clays or installation of ground improvement methods, deep foundation support can be considered for the main campus structure. Augercast piles (ACP) have been evaluated for deep foundation support of the proposed main campus structure. We have evaluated 16-, 18-, and 24-inch diameter ACP ranging in embedment depth from 30 to 45 feet below existing ground surface in the footprint of the proposed campus. UES should be contacted to revise ACP analyses if the pile cutoff elevations will be different than those assumed. If higher capacities are required, UES should be contacted to perform additional exploration and provide additional analyses and recommendations.

ACP should extend through zones of soft or loose soils into stable soil strata. Recommended maximum allowable axial resistances are presented in Table 6 for the proposed campus structure. The presented capacities are based on load testing being performed as subsequently described.

Table 6. Recommended Axial Capacities – ACP.

ACP Diameter (inches)	Embedment Length[a] (feet)	Allowable Axial Capacity (kips)	
		Compression	Uplift
16	30	50	27
	35	55	33
	40	61	38
	45	67	42
18	30	58	31
	35	62	38
	40	69	44
	45	76	49
24	30	82	45
	35	84	55
	40	94	63
	45	103	70

[a] Embedment length as measured from existing ground surface in the footprint of the main campus structure.

Foundation plans should be forwarded to UES to evaluate whether pile lengths should be revised based on the actual cutoff elevation and for evaluation of pile group settlement. The structural engineer should verify the structural capacity of the piles based on the requirements of the applicable building code. If different foundation systems, configurations, or higher load capacities are required, UES should be notified so that the required analyses may be performed in a timely manner.

7.7.1 Uplift Resistance

Allowable uplift capacities were calculated for ACP and are presented in Table 6 for the proposed campus structure. The allowable capacities include the effective weight of the pile plus side resistance. ACP resisting uplift loads should be provided with a full-depth tension reinforcement bar; high-capacity mechanical splices may be required.

7.7.2 ACP Pile Groups

The center-to-center pile spacing in a group should be at least three pile diameters. In such cases, the group axial capacity can be computed as the number of piles times the capacity of a single pile.

7.7.3 ACP Construction Considerations

ACP are constructed by displacing soil with a hollow-stem auger and pumping grout through the auger stem as it is withdrawn. The capacity and structural integrity of ACP are influenced significantly by the installation technique. Piles should be installed using a continuous hollow-stem auger, and cement grout should be pumped continuously during withdrawal of the auger. Groundwater was not encountered in the borings during drilling operations. If groundwater is

encountered during ACP construction, the auger withdrawal should be accomplished so that a positive head of grout (minimum of 5 feet) is maintained on the tip of the auger. The pump should be equipped with a functional pressure gage and a stroke counter or other means of accurately measuring the quantity of grout.

Because of the above construction considerations, it is essential that the work be observed by a representative of UES. The representative should observe the pressures used to pump the grout as well as the withdrawal rate of the auger to determine that the pile is being properly constructed. In addition, pile depths and abnormalities encountered during drilling reinforcement should be recorded.

7.7.4 ACP Static Load Testing

At least one pile compression test should be performed for each pile configuration (embedment, type, size, etc.) that is selected. The testing should be performed in accordance with ASTM D1143 using the quick loading procedure. Piles should be tested to a minimum of two times the allowable static compression load.

If the piles are to support net uplift loads, at least one tension load test is required. The test should be performed in accordance with ASTM D3689. Piles should be tested to a minimum of three times the allowable uplift load.

Load tests are required to verify the recommended pile capacity and should not be used to increase the design pile capacity. The piles used in load tests should not be used for support of structures. UES should be consulted regarding the locations of the test piles.

7.7.5 ACP Foundation Settlement

Once foundation plans have been completed, they should be forwarded to UES for pile settlement analyses.

7.7.6 ACP Lateral Load Analyses

Piles will deflect under applied lateral loads and external moments. The magnitude of the deflection will depend on the proposed pile type, embedment, arrangement, pile cap geometry and construction, and the applied axial and lateral loading. Once the foundation type, configurations, and design loads are determined, UES can perform lateral load analyses upon request.

If substantial lateral loads are to be supported by vertical piles a lateral load test is recommended, which is typically performed in accordance with ASTM D3966 standards.

7.8 Floor Slabs

The following floor slab recommendations are provided based on soft soils and high plasticity clays encountered at the site being remediated as discussed in Section 7.1 of this report.

The slab-on-grade floors should be supported on stable subgrade or compacted fill. The subgrade should be prepared as recommended in the Site Preparation and Earthwork section of this report. The floor slab should be underlain by a minimum 4-inch-thick layer of granular material to serve as a capillary break and a base of support. The granular material layer should be compacted per the requirements of Table 3. The top 8 inches of clayey floor slab subgrade should be compacted and moisture-conditioned per the requirements presented in Table 2 prior to placing the granular layer.

Care should be taken during slab-on-grade construction to not allow the subgrade to become desiccated or saturated. Additionally, consideration should be given to the timing of construction relative to the time of year and weather. If slab construction is performed during relatively cold and wet weather, lime- or cement-treatment of the subgrade could be beneficial to maintain progress during construction. Otherwise, the subgrade could be weakened by softening from saturation by rain and/or snow, leading to delays in reworking the subgrade to prepare it back to its pre-softened condition.

It is recommended control joints be provided within the concrete slab-on-grade floors. These joints should be sealed to mitigate surface water infiltration until the building is enclosed. The floor slab should be structurally separated from walls, columns, footings, and penetrations to allow independent movement of the floor. Alternatively, floor slabs that are not structurally independent should be designed to allow for differential movements of that normally occur between the floor slabs, columns, and foundation walls.

A 6- to 15-mil plastic sheet should be placed below the floor to reduce the potential for moisture to permeate the slab and the potential for mold growth within the building. Some designers prefer not to place a vapor barrier directly beneath the concrete floor because it could affect the curing of the concrete, resulting in “curling” of the slab. This concern can be addressed by embedding the vapor barrier in or below the crushed rock layer below the slab.

7.9 Pavements

A project-specific pavement design was not performed as vehicle loads and traffic patterns were not provided. The following floor slab recommendations are provided based on soft soils and high plasticity clays encountered at the site being remediated as discussed in Section 7.1 of this report.

Pavements are to be placed on stable in situ soil or compacted fill. The pavement subgrade should be proof-rolled and prepared as recommended in the Site Preparation and Earthwork section of this report. Once the subgrade is prepared, it should be promptly paved to protect it from the weather, as the naturally occurring soils in the area are susceptible to changes in the moisture content.

A project-specific pavement design was not performed as vehicle loads and traffic patterns were not provided. Pavements are to be placed on stable in situ soil or compacted fill. The pavement subgrade should be proof-rolled and prepared as recommended in the Site Preparation and Earthwork section of this report. Once the subgrade is prepared, it should be promptly paved to

protect it from the weather, as the naturally occurring soils in the area are susceptible to changes in the moisture content.

7.9.1 Flexible Pavements

The flexible pavement recommendations provided herein are based on the following assumed parameters for the 1993 AASTHO pavement design method.

Table 7. Assumed AASHTO Flexible Pavement Design Parameters.

Parameter	Light-Duty Pavement	Heavy-Duty Pavement
Reliability	90%	
Standard Deviation	0.49	
CBR	4.0	
Soil Resilient Modulus, M_R	6,000 psi	
Estimated Equivalent Single-Axle Loads (ESALs) Over the Design Life of the Facility	20,500	268,900
Drainage Coefficient	1.0	
Initial Serviceability	4.2	
Terminal Serviceability	2.0	
Structural Number, SN	2.0	3.0

To arrive at the layer thicknesses presented herein, a drainage coefficient of 1.0 was assumed. Recommendations for structural numbers (SN) of 2 and 3 have been provided for light- and heavy-duty sections, respectively; the required SN will be dependent on the number of equivalent single-axle loads (ESALs) estimated for the design life of the facility. Three alternative pavement sections for the considered SN's have been provided for consideration and cost evaluation.

Table 8. Flexible Pavement Thickness Recommendations

Layer Type	ARDOT Pavement Coefficient[a]	Light-Duty Pavement SN = 2.0 Layer Thicknesses (inches)			Heavy-Duty Pavement SN = 3.0 Layer Thicknesses (inches)		
		Alt. 1	Alt. 2	Alt. 3	Alt. 1	Alt. 2	Alt. 3
ACHM[b] Surface Course	0.44	2.0	2.0	2.0	2.0	2.0	2.0
ACHM[b] Base Course	0.36	--	--	--	2.5	2.5	2.5
Cement Treated Base (CTB)	0.20	6.0	--	--	6.0	--	--
Soil Cement Base	0.20	--	6.0	--	--	6.0	--
Crushed Stone Base	0.14	--	--	8.0	--	--	8.0

[a] The materials should meet the requirements set forth in the applicable sections of the Roadway Design Plan Development Guidelines, latest edition, published by the Arkansas Department of Transportation (ARDOT).
[b] ACHM = Asphalt Concrete Hot Mix.

7.9.2 Rigid Pavements

The alternative rigid pavement recommendations provided herein are based on the following assumed parameters for the 1993 AASHTO pavement design method.

Table 9. Assumed AASHTO Rigid Pavement Design Parameters.

Parameter	Light-Duty Pavement	Heavy-Duty Pavement
Reliability	90%	
Standard Deviation	0.35	
Composite Modulus of Subgrade Reaction (Accounting for Loss of Support)	50 pci	
Estimated Single-Axle Loads (ESALs) Over the Design Life of the Facility	65,100	384,100
Initial Serviceability	4.5	
Terminal Serviceability	2.0	
Concrete 28-Day Strength	4,000 psi	
Concrete Modulus of Elasticity	3,600,000 psi	
Concrete Modulus of Rupture	500 psi	
Load Transfer Coefficient	4.0	
Subbase Minimum Elastic Modulus	50,000 psi	

Table 10. Rigid Pavement Thickness Recommendations.

Layer Type	Light-Duty Pavement		Heavy-Duty Pavement	
	Layer Thicknesses (inches)		Layer Thicknesses (inches)	
	Alt. 1	Alt. 2	Alt. 1	Alt. 2
Portland Cement Concrete (PCC)	6.0	6.0	8.0	8.0
Soil Cement Subbase	7.0	--	7.0	--
Crushed Stone Subbase	--	7.0	--	7.0

Improved performance of rigid pavements can be achieved by designing with load transfer (dowel) bars between slabs. The diameter of the dowel bars is typically equal to one-eighth of the slab thickness (1 inch is recommended for heavy-duty pavements). The length of the bars should be a minimum of 18 inches (2 feet is preferable; 1 foot on each side of the joint). At expansion joint, the dowels should accommodate the lateral movement of the slab due to expansion/contraction. At contraction joints, the depth of the reservoir should equal ¾ of the slab thickness. Refer to AASHTO or American Concrete Pavement Association for further recommendations and verification of the values presented here.

7.10 Utility Construction

Settlement of trench backfill can result in unsightly depressions and localized pavement failures. The magnitude of settlement can be reduced by mechanically compacting the trench backfill. Select granular backfill can be used for pipe bedding and minimum cover for utilities. The remainder of the utility trenches should be backfilled with flowable fill or compacted clayey soils up to the design subgrade elevation to reduce the potential for water collecting in these trenches and being absorbed by the surrounding clays, causing heave of foundations, slabs, pavement, etc.

Granular bedding and backfill that exhibits a well-defined moisture density relationship should be compacted and moisture-conditioned per the requirements presented in Table 2; otherwise, the granular material should be compacted to at least the minimum relative densities indicated in Table 3 in the Site Grading section of this report.

Utility trench backfill should be placed in 6- to 8-inch thick lifts with each lift compacted to at least the specified degree of compaction. Thinner lifts should be used for lighter compaction equipment. The backfill should not be flushed with water in an attempt to obtain compaction.

For utilities within the perimeters of the proposed building, one of the following options can be implemented to further reduce the potential for water collecting in the utility trenches:

1. Use flowable fill in place of granular bedding and pipe zone backfill around utility pipes. Provisions should be implemented during construction to keep the pipes from floating in the flowable fill until the flowable fill sets.

2. The bottom of the utility excavation should generally be sloped to drain to a collection pipe (underdrain) in the bottom of the utility excavation at its downstream end. The collection pipe should then connect to an outlet, such as the proposed storm sewer system.

3. The granular bedding and pipe zone backfill should be capped with at least 1 foot of compacted clay backfill prior to the granular bedding and backfill collecting water. Additionally, concrete dams or anti-seepage collars should be provided where the utility crosses beneath the exterior footings of the proposed building. These dams or collars should extend at least 6 inches beyond the sides and bottoms of the utility trenches into the in-situ soils to stop water from migrating underneath the building. If groundwater seepage is observed in the utility excavations, this option should not be implemented, but rather one of the other two options.

Prior to placing the bedding and utilities within the utility trench, soft, saturated, and compressible material should be removed from the bottom of the trench to expose stiff soils.

8.0 RECOMMENDED ADDITIONAL SERVICES

The conclusions and recommendations given in this report are based on: UES' understanding of the proposed design and construction, as outlined in this report; site observations; interpretation

of the exploration data; and our experience. Since the intent of the design recommendations is best understood by UES, we recommend that UES be included in the final design and construction process, and be retained to review the project plans and specifications to confirm that the recommendations given in this report have been correctly implemented. We recommend that UES be retained to participate in pre-bid and preconstruction conferences to reduce the risk of misinterpretation of the conclusions and recommendations in this report relative to the proposed construction of the subject project.

Since actual subsurface conditions between boring locations could vary from those encountered in the borings, our design recommendations are subject to adjustment in the field based on the subsurface conditions encountered during construction. Therefore, we recommend that UES be retained to provide construction observation services as a continuation of the design process to confirm the recommendations in this report and to revise them accordingly to accommodate differing subsurface conditions. Construction observation is intended to enhance compliance with project plans and specifications. It is not insurance, nor does it constitute a warranty or guarantee of any type. Regardless of construction observation, contractors, suppliers, and others are solely responsible for the quality of their work and for adhering to plans and specifications.

9.0 LIMITATIONS

This report has been prepared on behalf of, and for the exclusive use of, the client for specific application to the named project as described herein. If this report is provided to other parties, it should be provided in its entirety with all supplementary information. In addition, the client should make it clear that the information is provided for factual data only, and not as a warranty of subsurface conditions presented in this report.

UES has attempted to conduct the services reported herein in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality and under similar conditions. The recommendations and conclusions contained in this report are professional opinions. The report is not a bidding document and should not be used for that purpose.

Our scope for this phase of the project did not include any environmental assessment or investigation for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater, or air, on or below or around this site. Any statements in this report or on the boring logs regarding odors noted or unusual or suspicious items or conditions observed are strictly for the information of our client. Our scope did not include an assessment of the effects of flooding and erosion of creeks or rivers adjacent to or on the project site.

Our scope did not include: any services to investigate or detect the presence of mold or any other biological contaminants (such as spores, fungus, bacteria, viruses, and the by-products of such organisms) on and around the site; or any services, designed or intended, to prevent or lower the risk of the occurrence of an infestation of mold or other biological contaminants.

The analyses, conclusions, and recommendations contained in this report are based on the data obtained from the geotechnical exploration. The field exploration methods used indicate subsurface conditions only at the specific locations where samples were obtained, only at the time they were obtained, and only to the depths penetrated. Consequently, subsurface conditions could vary gradually, abruptly, and/or nonlinearly between sample locations and/or intervals.

The conclusions or recommendations presented in this report should not be used without UES' review and assessment if the nature, design, or location of the facilities is changed, if there is a lapse in time between the submittal of this report and the start of work at the site, or if there is a substantial interruption or delay during work at the site. If changes are contemplated or delays occur, UES must be allowed to review them to assess their impact on the findings, conclusions, and/or design recommendations given in this report. UES will not be responsible for any claims, damages, or liability associated with any other party's interpretations of the subsurface data or with reuse of the subsurface data or engineering analyses in this report.

The recommendations included in this report have been based in part on assumptions about variations in site stratigraphy that can be evaluated further during earthwork and foundation construction. UES should be retained to perform construction observation and continue its geotechnical engineering service using observational methods. UES cannot assume liability for the adequacy of its recommendations when they are used in the field without UES being retained to observe construction.

APPENDIX A – IMPORTANT INFORMATION ABOUT THIS GEOTECHNICAL-ENGINEERING REPORT

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

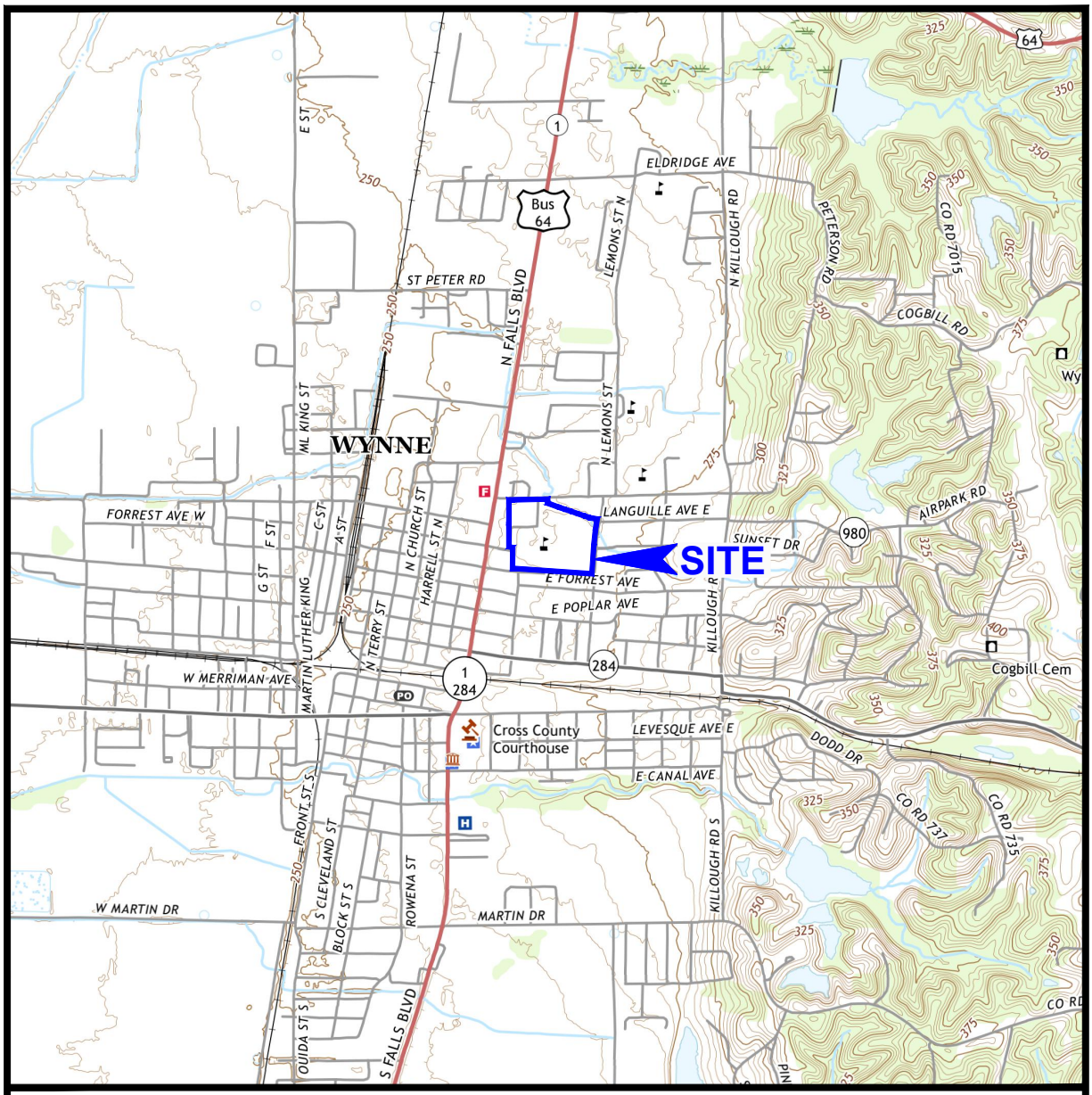
GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

APPENDIX B – FIGURES

Figure 1 – Site Location and Topography

Figure 2 – Aerial Photograph of Site and Exploration Locations



NOTES

1. Plan adapted from a 7.5 minute U.S.G.S. maps for Wynne, Arkansas quadrangle, last revised in 2020.

0 2,000 4,000

SCALE IN FEET

N

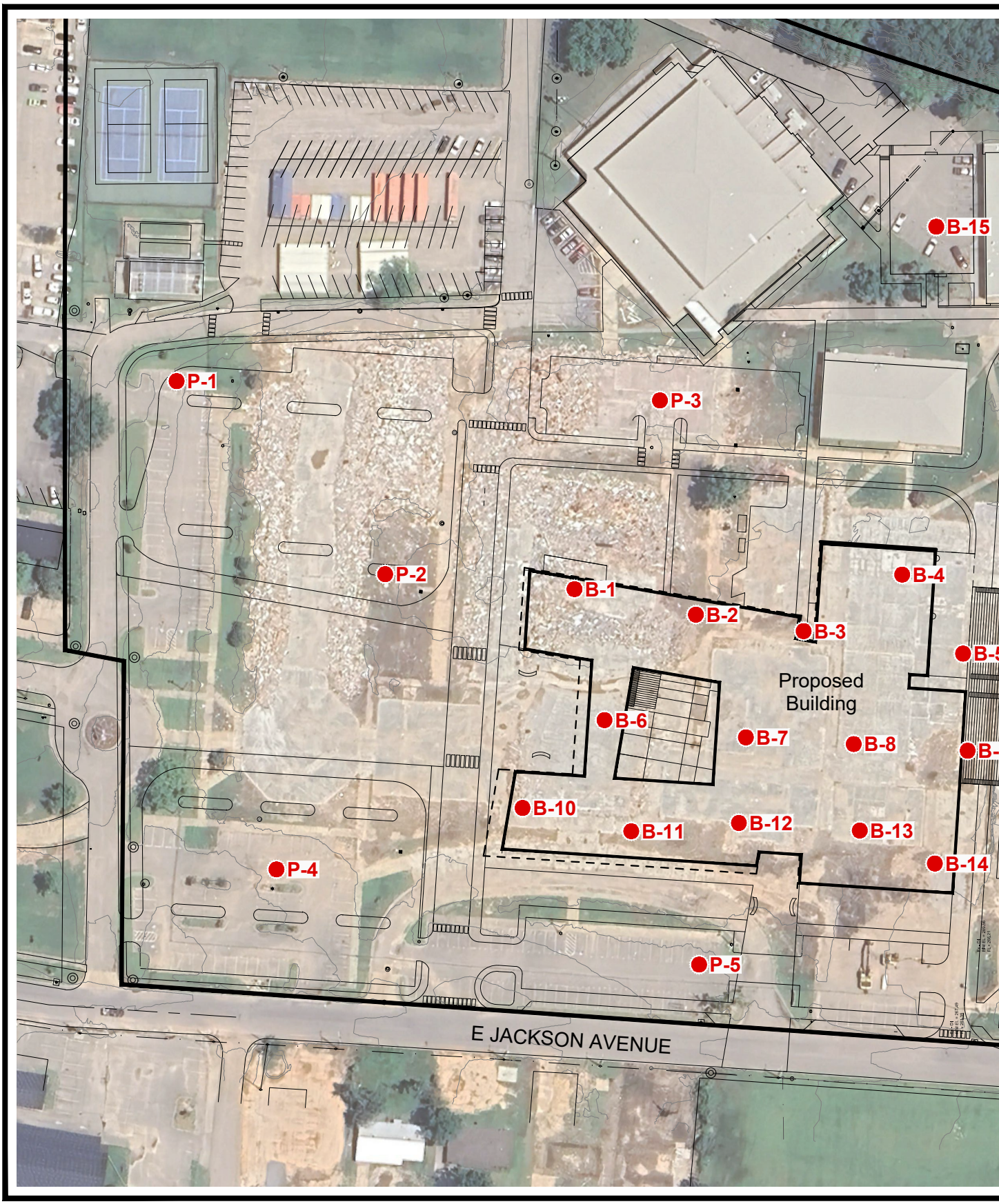
Drawn By: WAH	Ck'd By: JDM	App'vd By: ASE
Date: 2-21-24	Date: 3-27-24	Date: 3-27-24

UES

Wynne High School New Campus
Wynne, Arkansas

SITE LOCATION AND TOPOGRAPHY

Project Number J043641.01	FIGURE 1


B-15
P-1
P-3
P-2
B-1
B-2
B-3
B-4
Proposed
Building
B-6
B-7
B-8
B-10
B-11
B-12
B-13
B-14
P-4
P-5
E JACKSON AVENUE

APPENDIX C – BORING INFORMATION

Boring Logs

Boring Log Terms and Symbols

Surface Elevation: 265 Datum N/A

Completion Date: 2/29/24

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
		Topsoil: 4 inches			
		Soft to stiff, gray and brown to brown, silty, LEAN CLAY - (CL)		3-4-2	SS1
		89.6% passing No. 200 sieve		1-1-2	SS2
5	260			3-4-5	SS3
				1-4-4	SS4
10	255			1-2-3	SS5
15	250			1-3-4	SS6
		trace sand		2-3-6	SS7
20	245			3-5-6	SS8
		trace organics		2-4-7	SS9
25	240			3-3-5	SS10
		trace organics		2-2-4	SS11
30	235			2-2-3	SS12
		trace sand			
35	230				
40	225				
45	220				
		trace organics			
50	215	Boring terminated at 50 feet.			

SHEAR STRENGTH, tsf

Δ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2020.JDM - ELEVATIONS J043641.01.GPJ GTINC 0638301.GPJ 3/27/24

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM
WASHBORING FROM ___ FEET
WEC DRILLER KRF LOGGER
CME 750X DRILL RIG
HAMMER TYPE Auto
HAMMER EFFICIENCY 85 %

REMARKS:

Drawn by: SAS	Checked by: JDM	App'vd. by: ASE
Date: 3/5/24	Date: 3/27/24	Date: 3/27/24

UES™

Wynne High School New Campus
Wynne, Arkansas

LOG OF BORING: B- 1

Project No. J043641.01

Surface Elevation: 266 Datum N/A

Completion Date: 2/28/24

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
		Topsoil: 1 inch			
		Very soft to stiff, gray and brown to brown, LEAN CLAY, trace organics - (CL)		2-5-2	SS1
5	261			0-0-1	SS2
				0-1-2	SS3
10	256			1-4-4	SS4
				2-4-5	SS5
15	251			99	ST6
				2-3-3	SS7
20	246				
				2-3-4	SS8
25	241	Boring terminated at 50 feet.			
30	236				
35	231				
40	226				
45	221				
50	216				

SHEAR STRENGTH, tsf
Δ - UU/2 ○ - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2020.JDM - ELEVATIONS J043641.01.GPJ GTINC 0638301.GPJ 3/27/24

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM
WASHBORING FROM ___ FEET
WEC DRILLER KRF LOGGER
CME 750X DRILL RIG
HAMMER TYPE Auto
HAMMER EFFICIENCY 85 %

REMARKS:

Drawn by: SAS	Checked by: JDM	App'vd. by: ASE
Date: 3/8/24	Date: 3/27/24	Date: 3/27/24

UES™

Wynne High School New Campus
Wynne, Arkansas

LOG OF BORING: B- 2

Project No. J043641.01

Surface Elevation: 266 Datum N/A

Completion Date: 2/28/24

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
		Topsoil: 1 inch			
		Soft to medium stiff, gray and red to brown and gray, silty, LEAN CLAY, trace sand - CL		1-1-2	SS1
5	261			1-3-3	SS2
				1-2-4	SS3
				1-3-3	SS4
10	256				
				1-1-2	SS5
15	251				
				1-2-3	SS6
20	246				
				2-4-4	SS7
25	241	Boring terminated at 25 feet.			
30	236				
35	231				
40	226				
45	221				
50	216				

SHEAR STRENGTH, tsf
Δ - UU/2 ○ - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2020.JDM - ELEVATIONS J043641.01.GPJ GTINC 0638301.GPJ 3/27/24

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM
WASHBORING FROM ___ FEET
WEC DRILLER KRF LOGGER
CME 750X DRILL RIG
HAMMER TYPE Auto
HAMMER EFFICIENCY 85 %

REMARKS:

Drawn by: SAS	Checked by: JDM	App'vd. by: ASE
Date: 3/11/24	Date: 3/27/24	Date: 3/27/24

UES™

Wynne High School New Campus
Wynne, Arkansas

LOG OF BORING: B- 3

Project No. J043641.01

Surface Elevation: 266 Datum N/A

Completion Date: 2/26/24

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
		Concrete: 3 inches		
		Soft, brown and gray to brown, silty, LEAN CLAY - CL	1-1-1	SS1
		trace organics	1-2-2	SS2
5	261	Stiff, brown, FAT CLAY - (CH)	94	ST3
		Soft to stiff, brown, LEAN CLAY - CL	1-2-3	SS4
10	256		1-1-1	SS5
15	251		1-2-3	SS6
20	246		1-3-6	SS7
25	241		2-2-6	SS8
30	236		1-2-2	SS9
35	231		1-1-2	SS10
40	226		1-1-2	SS11
45	221		1-2-3	SS12
50	216	Boring terminated at 50 feet.		

GRAPHIC LOG

SHEAR STRENGTH, tsf
Δ - UU/2 ○ - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2020.JDM - ELEVATIONS J043641.01.GPJ GTINC 0638301.GPJ 3/27/24

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM
WASHBORING FROM 10 FEET
WEC DRILLER KRF LOGGER
CME 750X DRILL RIG
HAMMER TYPE Auto
HAMMER EFFICIENCY 85 %

REMARKS:

Drawn by: SAS	Checked by: JDM	App'vd. by: ASE
Date: 3/8/24	Date: 3/27/24	Date: 3/27/24

UES™

Wynne High School New Campus
Wynne, Arkansas

LOG OF BORING: B- 4

Project No. J043641.01

Surface Elevation: 266 Datum N/A

Completion Date: 2/26/24

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
		Concrete: 3 inches			
		Medium stiff, gray to brown, silty, LEAN CLAY - CL		2-3-4	SS1
		Stiff, brown, FAT CLAY - (CH)		93	ST2
5	261				
		Medium stiff to stiff, brown and gray, LEAN CLAY - CL		1-4-5	SS3
				2-3-4	SS4
10	256				
				1-2-3	SS5
15	251				
				1-3-4	SS6
20	246				
				2-6-7	SS7
25	241	Boring terminated at 25 feet.			
30	236				
35	231				
40	226				
45	221				
50	216				

SHEAR STRENGTH, tsf

Δ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

60

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2020.JDM - ELEVATIONS J043641.01.GPJ GTINC 0638301.GPJ 3/27/24

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM
WASHBORING FROM ___ FEET
WEC DRILLER KRF LOGGER
CME 750X DRILL RIG
HAMMER TYPE Auto
HAMMER EFFICIENCY 85 %

REMARKS:

Drawn by: SAS	Checked by: JDM	App'vd. by: ASE
Date: 3/8/24	Date: 3/27/24	Date: 3/27/24

UES™

Wynne High School New Campus
Wynne, Arkansas

LOG OF BORING: B- 5

Project No. J043641.01

Surface Elevation: 265 Datum N/A

Completion Date: 2/29/24

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
		Topsoil: 3 inches			
		Base Materials: Brown and gray clay and gravel		3-8-4	SS1
		Medium dense, brown, CLAYEY SAND, trace roots and gravel - SC			
5	260	36.6% passing No. 200 sieve		2-3-3	SS2
		Medium stiff to stiff, brown and gray, silty, LEAN CLAY - CL		3-7-6	SS3
		some sand			
		trace organics		2-3-4	SS4
10	255				
		trace sand		1-2-3	SS5
15	250				
				2-2-4	SS6
20	245				
		trace sand and organics		2-4-6	SS7
25	240	Boring terminated at 25 feet.			
30	235				
35	230				
40	225				
45	220				
50	215				

SHEAR STRENGTH, tsf

Δ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2020.JDM - ELEVATIONS J043641.01.GPJ GTINC 0638301.GPJ 3/27/24

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM
WASHBORING FROM ___ FEET
WEC DRILLER JWD LOGGER
CME 750X DRILL RIG
HAMMER TYPE Auto
HAMMER EFFICIENCY 85 %

REMARKS:

Drawn by: SAS	Checked by: JDM	App'vd. by: ASE
Date: 3/8/24	Date: 3/27/24	Date: 3/27/24

UES™

Wynne High School New Campus
Wynne, Arkansas

LOG OF BORING: B- 6

Project No. J043641.01

Surface Elevation: 266 Datum N/A

Completion Date: 2/28/24

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
		Topsoil: 1 inch			
		Soft to medium stiff, brown and gray, silty, LEAN CLAY, trace sand - (CL)		1-1-2	SS1
		little sand, trace organics and roots		1-1-2	SS2
5	261			1-1-2	SS3
				2-3-4	SS4
10	256				
				2-3-4	SS5
15	251				
				2-3-5	SS6
20	246				
				2-3-4	SS7
25	241	Boring terminated at 25 feet.			
30	236				
35	231				
40	226				
45	221				
50	216				

SHEAR STRENGTH, tsf
Δ - UU/2 ○ - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2020.JDM - ELEVATIONS J043641.01.GPJ GTINC 0638301.GPJ 3/27/24

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM
WASHBORING FROM ___ FEET
WEC DRILLER KRF LOGGER
CME 750X DRILL RIG
HAMMER TYPE Auto
HAMMER EFFICIENCY 85 %

REMARKS:

Drawn by: SAS	Checked by: JDM	App'vd. by: ASE
Date: 3/11/24	Date: 3/27/24	Date: 3/27/24

UES™

Wynne High School New Campus
Wynne, Arkansas

LOG OF BORING: B- 7

Project No. J043641.01

Surface Elevation: 266 Datum N/A

Completion Date: 2/26/24

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
		Concrete: 3 inches			
		Medium stiff to stiff, brown and gray, silty, LEAN CLAY, trace organics - CL		2-4-6	SS1
				2-3-5	SS2
5	261			2-3-5	SS3
		trace organics		2-2-3	SS4
10	256			2-2-3	SS5
15	251			1-3-3	SS6
		trace sand		2-3-6	SS7
20	246				
		trace organics			
25	241	Boring terminated at 25 feet.			
30	236				
35	231				
40	226				
45	221				
50	216				

SHEAR STRENGTH, tsf
Δ - UU/2 ○ - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2020.JDM - ELEVATIONS J043641.01.GPJ GTINC 0638301.GPJ 3/27/24

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM
WASHBORING FROM ___ FEET
WEC DRILLER KRF LOGGER
CME 750X DRILL RIG
HAMMER TYPE Auto
HAMMER EFFICIENCY 85 %

REMARKS:

Drawn by: SAS	Checked by: JDM	App'vd. by: ASE
Date: 3/8/24	Date: 3/27/24	Date: 3/27/24

UES™

Wynne High School New Campus
Wynne, Arkansas

LOG OF BORING: B- 8

Project No. J043641.01

Surface Elevation: 266 Datum N/A

Completion Date: 2/27/24

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
		Concrete: 3 inches			
		Soft to stiff, brown and gray, silty, LEAN CLAY, trace sand - CL		3-6-8	SS1
		some sand			
5	261	trace gravel and organics		2-3-4	SS2
		trace organics			
				2-5-5	SS3
		trace gravel		1-4-4	SS4
10	256				
				1-2-2	SS5
15	251				
		trace organics		2-2-4	SS6
20	246				
				2-6-6	SS7
25	241	Boring terminated at 25 feet.			
30	236				
35	231				
40	226				
45	221				
50	216				

SHEAR STRENGTH, tsf
Δ - UU/2 ○ - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2020.JDM - ELEVATIONS J043641.01.GPJ GTINC 0638301.GPJ 3/27/24

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM
WASHBORING FROM ___ FEET
WEC DRILLER KRF LOGGER
CME 750X DRILL RIG
HAMMER TYPE Auto
HAMMER EFFICIENCY 85 %

REMARKS:

Drawn by: SAS	Checked by: JDM	App'vd. by: ASE
Date: 3/11/24	Date: 3/27/24	Date: 3/27/24

UES™

Wynne High School New Campus
Wynne, Arkansas

LOG OF BORING: B- 9

Project No. J043641.01

Surface Elevation: 266 Datum N/A

Completion Date: 2/27/24

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
		Concrete: 3 inches		
		Medium dense, brown, gray and tan, CLAYEY SAND, trace roots - SC	2-6-5	SS1
		3-inch gray clay seam		
		Soft to stiff, gray and red to brown and gray, LEAN CLAY - (CL)	2-3-3	SS2
5	261		96	ST3
			1-3-3	SS4
10	256			
			1-2-2	SS5
15	251			
			1-2-3	SS6
20	246			
		Very stiff, gray, clayey SILT, trace sand - ML	3-10-13	SS7
25	241			
		Soft to stiff, brown, silty, LEAN CLAY - CL	2-3-4	SS8
30	236			
			2-4-6	SS9
35	231			
			3-4-5	SS10
40	226			
			1-2-2	SS11
45	221			
			2-2-5	SS12
50	216	Boring terminated at 50 feet.		

SHEAR STRENGTH, tsf
Δ - UU/2 ○ - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2020.JDM - ELEVATIONS: J043641.01.GPJ GTINC 0638301.GPJ 3/27/24

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM
WASHBORING FROM 10 FEET
WEC DRILLER KRF LOGGER
CME 750X DRILL RIG
HAMMER TYPE Auto
HAMMER EFFICIENCY 85 %

REMARKS:

Drawn by: SAS	Checked by: JDM	App'vd. by: ASE
Date: 3/11/24	Date: 3/27/24	Date: 3/27/24

UES™

Wynne High School New Campus
Wynne, Arkansas

LOG OF BORING: B-10

Project No. J043641.01

Surface Elevation: 266 Datum N/A

Completion Date: 2/28/24

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
		Medium stiff to stiff, gray and red to brown and gray, silty, LEAN CLAY, trace sand - (CL)		
		trace roots	2-5-4	SS1
5	261		2-4-5	SS2
		little sand	2-4-6	SS3
		trace organics	1-3-3	SS4
10	256		91	ST5
			2-4-4	SS6
15	251			
			2-3-4	SS7
20	246			
		little sand	4-7-7	SS8
25	241	Boring terminated at 25 feet.		
30	236			
35	231			
40	226			
45	221			
50	216			

SHEAR STRENGTH, tsf
Δ - UU/2 ○ - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2020.JDM - ELEVATIONS J043641.01.GPJ GTINC 0638301.GPJ 3/27/24

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM
WASHBORING FROM ___ FEET
WEC DRILLER KRF LOGGER
CME 750X DRILL RIG
HAMMER TYPE Auto
HAMMER EFFICIENCY 85 %

REMARKS:

Drawn by: SAS	Checked by: JDM	App'vd. by: ASE
Date: 3/11/24	Date: 3/27/24	Date: 3/27/24

UES™

Wynne High School New Campus
Wynne, Arkansas

LOG OF BORING: B-11

Project No. J043641.01

Surface Elevation: 266 Datum N/A

Completion Date: 2/28/24

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
		Soft to stiff, brown and gray, silty, LEAN CLAY, trace sand - CL		1-2-1	SS1
		trace gravel			
5	261			2-3-4	SS2
				3-5-7	SS3
10	256			2-4-4	SS4
				2-2-2	SS5
15	251				
				2-3-3	SS6
20	246				
				3-5-7	SS7
25	241	Boring terminated at 25 feet.			
30	236				
35	231				
40	226				
45	221				
50	216				

SHEAR STRENGTH, tsf

Δ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2020.JDM - ELEVATIONS J043641.01.GPJ GTINC 0638301.GPJ 3/27/24

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM
WASHBORING FROM ___ FEET
WEC DRILLER KRF LOGGER
CME 750X DRILL RIG
HAMMER TYPE Auto
HAMMER EFFICIENCY 85 %

REMARKS:

Drawn by: SAS	Checked by: JDM	App'vd. by: ASE
Date: 3/11/24	Date: 3/27/24	Date: 3/27/24

UES™

Wynne High School New Campus
Wynne, Arkansas

LOG OF BORING: B-12

Project No. J043641.01

Surface Elevation: 266 Datum N/A

Completion Date: 2/27/24

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
		Concrete: 3 inches			
		Medium stiff to stiff, brown and gray to gray and red, silty, LEAN CLAY, trace sand - CL		1-3-6	SS1
		some sand		1-3-3	SS2
5	261	trace organics		2-3-7	SS3
				3-4-7	SS4
10	256				
				3-4-6	SS5
15	251				
				2-3-4	SS6
20	246				
				3-4-8	SS7
25	241	Boring terminated at 25 feet.			
30	236				
35	231				
40	226				
45	221				
50	216				

SHEAR STRENGTH, tsf

Δ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2020.JDM - ELEVATIONS J043641.01.GPJ GTINC 0638301.GPJ 3/27/24

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM
WASHBORING FROM ___ FEET
WEC DRILLER KRF LOGGER
CME 750X DRILL RIG
HAMMER TYPE Auto
HAMMER EFFICIENCY 85 %

REMARKS:

Drawn by: SAS	Checked by: JDM	App'vd. by: ASE
Date: 3/11/24	Date: 3/27/24	Date: 3/27/24

UES™

Wynne High School New Campus
Wynne, Arkansas

LOG OF BORING: B-13

Project No. J043641.01

Surface Elevation: 266 Datum N/A

Completion Date: 2/27/24

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
		Concrete: 3 inches		
		Soft to stiff, brown to gray and red, silty, LEAN CLAY, trace sand - CL	2-2-4	SS1
		trace gravel		
5	261		2-6-6	SS2
			2-4-6	SS3
			2-5-6	SS4
10	256			
			2-4-6	SS5
15	251			
			2-2-6	SS6
20	246			
			2-4-6	SS7
25	241			
			2-5-7	SS8
30	236			
			2-5-7	SS9
35	231			
			1-3-4	SS10
40	226			
			1-1-2	SS11
45	221			
			2-2-5	SS12
50	216	Boring terminated at 50 feet.		

GRAPHIC LOG

SHEAR STRENGTH, tsf
Δ - UU/2 ○ - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM
WASHBORING FROM 10 FEET
WEC DRILLER KRF LOGGER
CME 750X DRILL RIG
HAMMER TYPE Auto
HAMMER EFFICIENCY 85 %

REMARKS:

Drawn by: SAS	Checked by: JDM	App'vd. by: ASE
Date: 3/11/24	Date: 3/27/24	Date: 3/27/24

UES™

Wynne High School New Campus
Wynne, Arkansas

LOG OF BORING: B-14

Project No. J043641.01

LOG OF BORING 2020.JDM - ELEVATIONS J043641.01.GPJ GTINC 0638301.GPJ 3/27/24

Surface Elevation: 266 Datum N/A

Completion Date: 3/4/24

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
		Stiff to very stiff, gray and brown, silty, LEAN CLAY - CL trace roots		4-5-6	SS1
		trace gravel and sand		8-12-12	SS2
5	261				
		trace organics		5-7-9	SS3
				5-7-9	SS4
10	256				
		Stiff, brown SILT - ML 97.7% passing No. 200 sieve		6-7-8	SS5
15	251				
		Stiff, brown and tan, silty, LEAN CLAY - CL		4-5-7	SS6
20	246				
				4-5-8	SS7
25	241	Boring terminated at 25 feet.			
30	236				
35	231				
40	226				
45	221				
50	216				

SHEAR STRENGTH, tsf

Δ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2020.JDM - ELEVATIONS J043641.01.GPJ GTINC 0638301.GPJ 3/27/24

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM
WASHBORING FROM ___ FEET
KJB DRILLER KRF LOGGER
CME 750X DRILL RIG
HAMMER TYPE Auto
HAMMER EFFICIENCY 85 %

REMARKS:

Drawn by: SAS	Checked by: JDM	App'vd. by: ASE
Date: 3/5/24	Date: 3/27/24	Date: 3/27/24

UES™

Wynne High School New Campus
Wynne, Arkansas

LOG OF BORING: B-15

Project No. J043641.01

Surface Elevation: 265 Datum N/A

Completion Date: 2/29/24

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
		Asphalt: 2 inches			
		Base materials: chert gravel and sand		4-7-13	SS1
		Very stiff, brown and gray, silty, LEAN CLAY, trace gravel - CL		0-0-1	SS2
5	260	Very soft, brown, sandy, LEAN CLAY - CL			
		Boring terminated at 5 feet.			
10	255				
15	250				
20	245				
25	240				
30	235				
35	230				
40	225				
45	220				
50	215				

SHEAR STRENGTH, tsf

Δ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2020.JDM - ELEVATIONS J043641.01.GPJ GTINC 0638301.GPJ 3/27/24

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM
WASHBORING FROM ___ FEET
WEC DRILLER JWD LOGGER
CME 750X DRILL RIG
HAMMER TYPE Auto
HAMMER EFFICIENCY 85 %

REMARKS:

Drawn by: SAS	Checked by: JDM	App'vd. by: ASE
Date: 3/11/24	Date: 3/27/24	Date: 3/27/24

UES™

Wynne High School New Campus
Wynne, Arkansas

LOG OF BORING: P- 1

Project No. J043641.01

Surface Elevation: 266 Datum N/A

Completion Date: 2/29/24

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
		Topsoil: 2 inches			
		Soft to medium stiff, brown, LEAN CLAY - CL		3-3-8	SS1
		trace roots		3-3-1	SS2
5	261	Boring terminated at 5 feet.			
10	256				
15	251				
20	246				
25	241				
30	236				
35	231				
40	226				
45	221				
50	216				

SHEAR STRENGTH, tsf
Δ - UU/2 ○ - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2020.JDM - ELEVATIONS J043641.01.GPJ GTINC 0638301.GPJ 3/27/24

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM
WASHBORING FROM ___ FEET
WEC DRILLER JWD LOGGER
CME 750X DRILL RIG
HAMMER TYPE Auto
HAMMER EFFICIENCY 85 %

REMARKS:

Drawn by: SAS	Checked by: JDM	App'vd. by: ASE
Date: 3/11/24	Date: 3/27/24	Date: 3/27/24

UES™

Wynne High School New Campus
Wynne, Arkansas

LOG OF BORING: P- 2

Project No. J043641.01

Surface Elevation: 265 Datum N/A

Completion Date: 2/29/24

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
		Topsoil: 3 inches			
		Soft to stiff, red, gray and brown, LEAN CLAY, trace organics and sand - (CL)		2-1-2	SS1
				2-4-5	SS2
5	260	Boring terminated at 5 feet.			
10	255				
15	250				
20	245				
25	240				
30	235				
35	230				
40	225				
45	220				
50	215				

SHEAR STRENGTH, tsf

Δ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2020.JDM - ELEVATIONS J043641.01.GPJ GTINC 0638301.GPJ 3/27/24

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM
WASHBORING FROM ___ FEET
WEC DRILLER JWD LOGGER
CME 750X DRILL RIG
HAMMER TYPE Auto
HAMMER EFFICIENCY 85 %

REMARKS:

Drawn by: SAS	Checked by: JDM	App'vd. by: ASE
Date: 3/11/24	Date: 3/27/24	Date: 3/27/24

UES™

Wynne High School New Campus
Wynne, Arkansas

LOG OF BORING: P- 3

Project No. J043641.01

Surface Elevation: 265 Datum N/A

Completion Date: 2/29/24

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
		Asphalt: 2 inches			
		Base Material: chert gravel and sand		7-25-11	SS1
		Hard, gray, silty, sandy, LEAN CLAY, trace gravel - CL		2-5-4	SS2
5	260	Stiff, gray and red, silty, LEAN CLAY, trace sand - CL			
		Boring terminated at 5 feet.			
10	255				
15	250				
20	245				
25	240				
30	235				
35	230				
40	225				
45	220				
50	215				

SHEAR STRENGTH, tsf

Δ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2020.JDM - ELEVATIONS J043641.01.GPJ GTINC 0638301.GPJ 3/27/24

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM
WASHBORING FROM ___ FEET
WEC DRILLER JWD LOGGER
CME 750X DRILL RIG
HAMMER TYPE Auto
HAMMER EFFICIENCY 85 %

REMARKS:

Drawn by: SAS	Checked by: JDM	App'vd. by: ASE
Date: 3/11/24	Date: 3/27/24	Date: 3/27/24

UES™

Wynne High School New Campus
Wynne, Arkansas

LOG OF BORING: P- 4

Project No. J043641.01

Surface Elevation: 266 Datum N/A

Completion Date: 2/29/24

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
		Asphalt: 2 inches			
		Base materials: chert gravel and sand		2-2-3	SS1
		Medium stiff, brown and gray, silty, LEAN CLAY - CL			
		little organics		2-3-5	SS2
5	261	trace sand			
		Boring terminated at 5 feet.			
10	256				
15	251				
20	246				
25	241				
30	236				
35	231				
40	226				
45	221				
50	216				

SHEAR STRENGTH, tsf

Δ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2020.JDM - ELEVATIONS J043641.01.GPJ GTINC 0638301.GPJ 3/27/24

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM
WASHBORING FROM ___ FEET
WEC DRILLER JWD LOGGER
CME 750X DRILL RIG
HAMMER TYPE Auto
HAMMER EFFICIENCY 85 %

REMARKS:

Drawn by: SAS	Checked by: JDM	App'vd. by: ASE
Date: 3/11/24	Date: 3/27/24	Date: 3/27/24

UES™

Wynne High School New Campus
Wynne, Arkansas

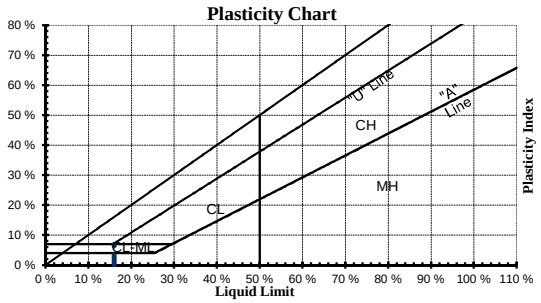
LOG OF BORING: P- 5

Project No. J043641.01

BORING LOG: TERMS AND SYMBOLS

LEGEND

CS	Continuous Sampler
GB	Grab Sample
NQ	NQ Rock Core
PST	Three-Inch Diameter Piston Tube Sample
SS	Split-Spoon Sample (Standard Penetration Test)
ST	Three-Inch Diameter Shelby Tube Sample
*	Sample Not Recovered
PL	Plastic Limit (ASTM D4318)
LL	Liquid Limit (ASTM D4318)
SV	Shear Strength from Field Vane (ASTM D2573)
UU	Shear Strength from Unconsolidated-Undrained Triaxial Compression Test (ASTM D2850)
QU	Shear Strength from Unconfined Compression Test (ASTM D2166)



SOIL GRAIN SIZE

US STANDARD SIEVE

12"	3"	3/4"	4	10	40	200

BOULDERS	COBBLES	GRAVEL		SAND			SILT	CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE		

300	76.2	19.1	4.76	2.00	0.42	0.074	0.005

SOIL GRAIN SIZE IN MILLIMETERS

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions			*Symbol*	*Description*
Coarse-Grained Soils (More than 50% Larger than No. 200 Sieve Size)	Gravel and Gravelly Soil	Clean Gravels Little or no Fines	GW	Well-Graded Gravel, Gravel- Sand Mixture
			GP	Poorly-Graded Gravel, Gravel-Sand Mixture
		Gravels with Appreciable Fines	GM	Silty Gravel, Gravel-Sand-Silt Mixture
			GC	Clayey-Gravel, Gravel-Sand-Clay Mixture
	Sand and Sandy Soils	Clean Sands Little or no Fines	SW	Well-Graded Sand, Gravelly Sand
			SP	Poorly-Graded Sand, Gravelly Sand
		Sands with Appreciable Fines	SM	Silty Sand, Sand-Silt Mixture
			SC	Clayey-Sand, Sand-Clay Mixture
Fine-Grained Soils (More than 50% Smaller than No. 200 Sieve Size)	Silts and Clays	Liquid Limit Less Than 50	ML	Silt, Sandy Silt, Clayey Silt, Slight Plasticity
			CL	Lean Clay, Sandy Clay, Silty Clay, Low to Medium Plasticity
			OL	Organic Silts or Lean Clays, Low Plasticity
	Silts and Clays	Liquid Limit Greater Than 50	MH	Silt, High Plasticity
			CH	Fat Clay, High Plasticity
			OH	Organic Clay, Medium to High Plasticity
	Highly Organic Soils		PT	Peat, Humus, Swamp Soil

STRENGTH OF COHESIVE SOILS

Consistency	*Undrained Shear Strength (tsf)*	*Unconfined Comp. Strength (tsf)*
Very Soft	less than 0.125	less then 0.25
Soft	0.125 to 0.25	0.25 to 0.5
Medium Stiff	0.25 to 0.5	0.5 to 1.0
Stiff	0.5 to 1.0	1.0 to 2.0
Very Stiff	1.0 to 2.0	2.0 to 3.0
Hard	greater than 2.0	greater than 4.0

DENSITY OF GRANULAR SOILS

Descriptive Term	*Approximate N_{60}-Value Range*
Very Loose	0 to 4
Loose	5 to 10
Medium Dense	11 to 30
Dense	31 to 50
Very Dense	>50

N-Value (Blow Count) is the last two, 6-inch drive increments (i.e. 4/7/9, N = 7 + 9 = 16). Values are shown as a summation on the grid plot and shown in the Unit Dry Weight/SPT column.

RELATIVE COMPOSITION

Trace	0 to 10%
Little	10 to 20%
Some	20 to 35%
And	35 to 50%

OTHER TERMS

Layer - Inclusion greater than 3 inches thick.
Seam - Inclusion 1/8-inch to 3 inches thick
Parting - Inclusion less than 1/8-inch thick
Pocket - Inclusion of material that is smaller than sample diameter

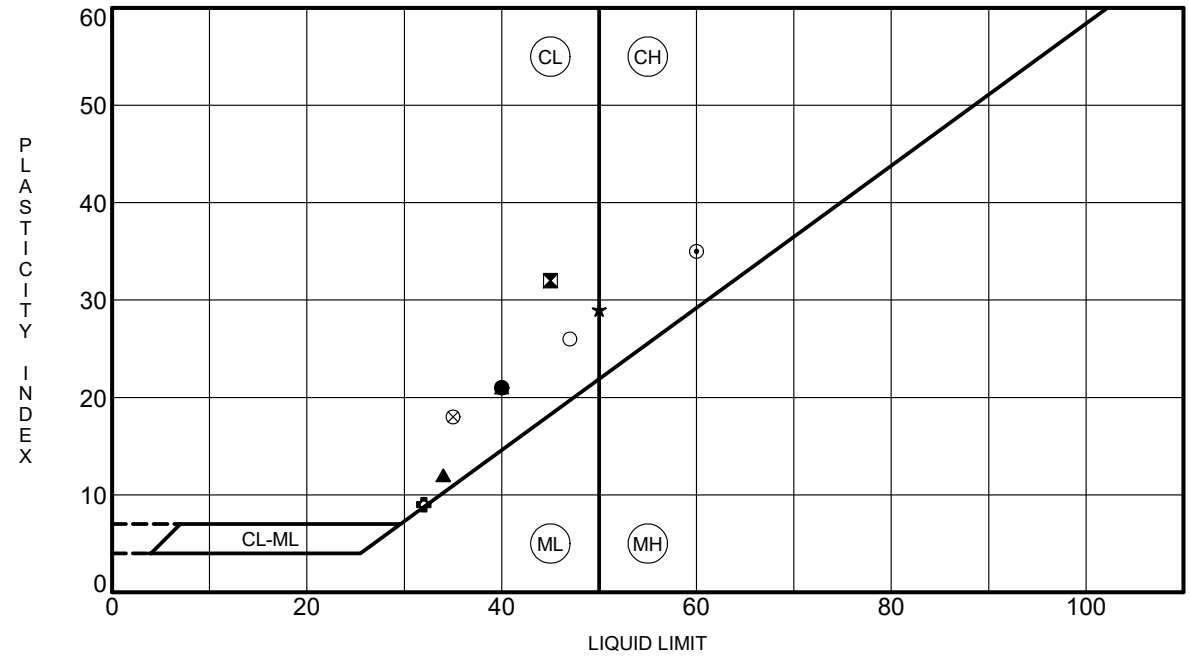
GEOTECHNOLOGY
A UES Company

Relative composition and Unified Soil Classification System (USCS) designations are based on visual descriptions and are approximate only. If laboratory tests were performed to classify the soil, the USCS designation is shown in parenthesis.

APPENDIX D – LABORATORY TEST DATA

Atterberg Limits Results

Unconsolidated-Undrained Triaxial Compression



	Specimen Identification		LL	PL	PI	Fines	Classification
●	B- 1	3.5	40	19	21	90	LEAN CLAY(CL)
⊠	B- 2	3.5	45	13	32		LEAN CLAY(CL)
▲	B- 2	15.0	34	22	12		LEAN CLAY(CL)
★	B- 4	6.0	50	21	29		FAT CLAY(CH)
⊙	B- 5	3.0	60	25	35		FAT CLAY(CH)
✿	B- 7	6.0	32	23	9		LEAN CLAY(CL)
○	B-10	6.0	47	21	26		LEAN CLAY(CL)
△	B-11	10.0	40	19	21		LEAN CLAY(CL)
⊗	P- 3	1.0	35	17	18		LEAN CLAY(CL)

UES™

ATTERBERG LIMITS RESULTS

Wynne High School New Campus
Wynne, Arkansas
J043641.01

US ATTERBERG LIMITS J043641.01.GPJ US LAB.GDT 3/27/24

UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST ON COHESIVE SOILS
ASTM D2850

CLIENT : ARCH 1010 DATE: 3/22/2024
PROJECT NO.: J043641.01
PROJECT: Wynne High School New Campus, Wynne, AR
LOCATION: Wynne, AR

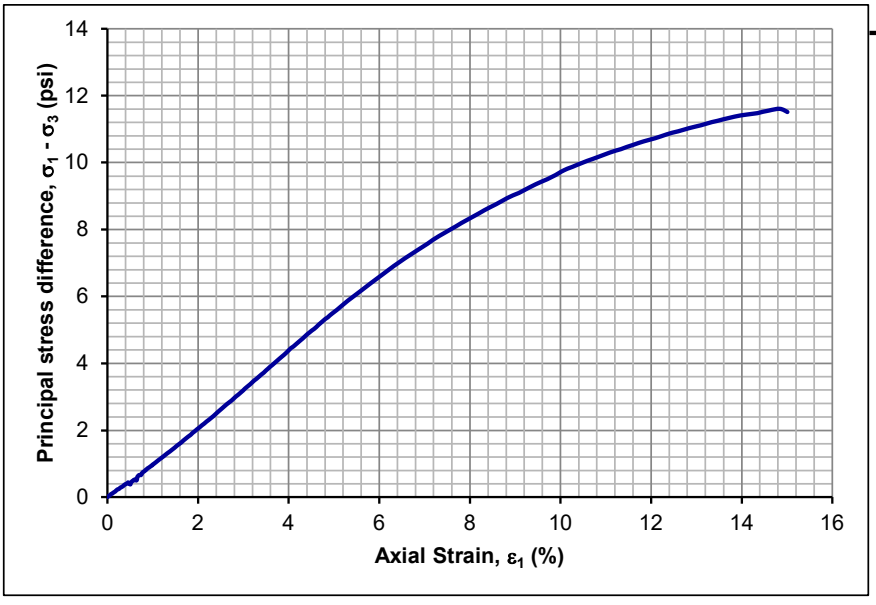
BORING NO.: B-2 SAMPLE NO.: ST-6 DEPTH (ft.): 15.0-17.0
SAMPLE OBTAINED BY: Shelby Tube CONDITION: Undisturbed
SAMPLE DESCRIPTION: Brown Lean Clay

LIQUID LIMIT (%): 34 PLASTIC LIMIT (%): 22 PLASTICITY INDEX (%): 12 USCS: CL

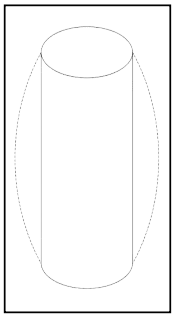
SPECIFIC GRAVITY OF SOLIDS: 2.75 (Assumed) LOAD CELL NO.:

INITIAL SAMPLE DATA	
AVERAGE DIAMETER (in.):	2.78
HEIGHT (in.):	5.62
HEIGHT TO DIAMETER RATIO:	2.02
WET UNIT WEIGHT (pcf):	127.0
DRY UNIT WEIGHT (pcf):	98.9
VOID RATIO:	0.74
MOISTURE CONTENT (%)*:	28.4
DEGREE OF SATURATION (%):	100.0

FAILURE DATA***	
MOISTURE CONTENT AFTER FAILURE (%)**:	**28.8**
AVERAGE RATE OF AXIAL STRAIN TO FAILURE (%/min.):	**1.0**
AXIAL STRAIN AT FAILURE (%):	**14.8**
PRINCIPAL STRESS DIFFERENCE AT FAILURE, $\sigma_1 - \sigma_3$ (psi):	**11.6**
MINOR PRINCIPAL STRESS AT FAILURE, σ_3 (psi):	**9.3**
MAJOR PRINCIPAL STRESS AT FAILURE, σ_1 (psi):	**20.9**
UNDRAINED COMPRESSIVE STRENGTH, U_u (psf):	**1,670**
UNDRAINED SHEAR STRENGTH, s_u (psf):	**835**
LIMITING UNDRAINED COMP. STRESS @ 10% STRAIN (psf):	**1,400**



FAILURE SHAPES



REMARKS :

* Initial moisture content determined from sample cuttings.
** Final moisture content determined from entire sample.
*** Failure stress values have been corrected for membrane effects.

UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST ON COHESIVE SOILS
ASTM D2850

CLIENT : ARCH 1010 DATE: 3/27/2024
PROJECT NO.: J043641.01
PROJECT: Wynne High School New Campus, Wynne, AR
LOCATION: Wynne, AR

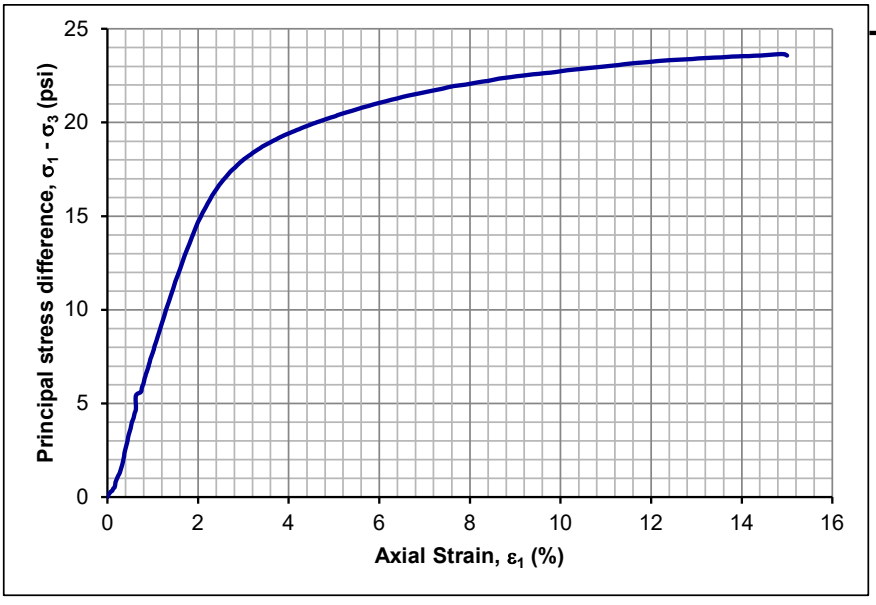
BORING NO.: B-4 SAMPLE NO.: ST-3 DEPTH (ft.): 6.0-8.0
SAMPLE OBTAINED BY: Shelby Tube CONDITION: Undisturbed
SAMPLE DESCRIPTION: Brown Fat Clay, Little Sand, Trace Gravel

LIQUID LIMIT (%): 50 PLASTIC LIMIT (%): 21 PLASTICITY INDEX (%): 29 USCS: CH

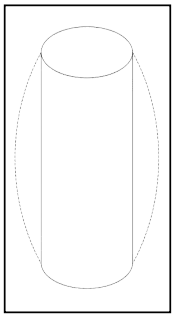
SPECIFIC GRAVITY OF SOLIDS: 2.75 (Assumed) LOAD CELL NO.:

INITIAL SAMPLE DATA	
AVERAGE DIAMETER (in.):	2.86
HEIGHT (in.):	5.72
HEIGHT TO DIAMETER RATIO:	2.00
WET UNIT WEIGHT (pcf):	120.6
DRY UNIT WEIGHT (pcf):	94.0
VOID RATIO:	0.83
MOISTURE CONTENT (%)*:	28.3
DEGREE OF SATURATION (%):	94.2

FAILURE DATA***	
MOISTURE CONTENT AFTER FAILURE (%)**:	**26.9**
AVERAGE RATE OF AXIAL STRAIN TO FAILURE (%/min.):	**1.0**
AXIAL STRAIN AT FAILURE (%):	**14.9**
PRINCIPAL STRESS DIFFERENCE AT FAILURE, $\sigma_1 - \sigma_3$ (psi):	**23.7**
MINOR PRINCIPAL STRESS AT FAILURE, σ_3 (psi):	**4.1**
MAJOR PRINCIPAL STRESS AT FAILURE, σ_1 (psi):	**27.7**
UNDRAINED COMPRESSIVE STRENGTH, U_u (psf):	**3,410**
UNDRAINED SHEAR STRENGTH, s_u (psf):	**1,705**
LIMITING UNDRAINED COMP. STRESS @ 10% STRAIN (psf):	**3,275**



FAILURE SHAPES



REMARKS :

* Initial moisture content determined from sample cuttings.
** Final moisture content determined from entire sample.
*** Failure stress values have been corrected for membrane effects.

UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST ON COHESIVE SOILS
ASTM D2850

CLIENT : ARCH 1010 DATE: 3/26/2024
PROJECT NO.: J043641.01
PROJECT: Wynne High School New Campus, Wynne, AR
LOCATION: Wynne, AR

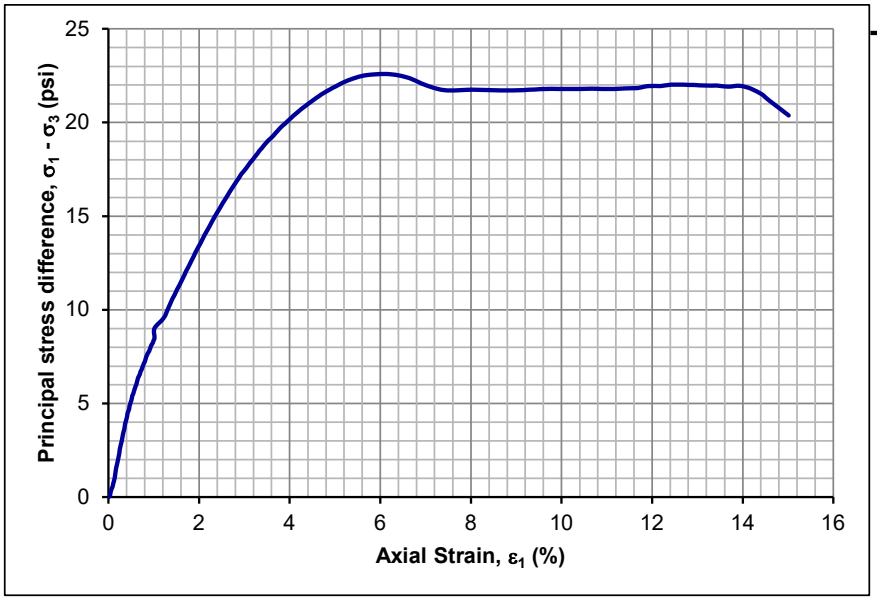
BORING NO.: B-5 SAMPLE NO.: ST-2 DEPTH (ft.): 3.0-5.0
SAMPLE OBTAINED BY: Shelby Tube CONDITION: Undisturbed
SAMPLE DESCRIPTION: Brown Fat Clay

LIQUID LIMIT (%): 60 PLASTIC LIMIT (%): 25 PLASTICITY INDEX (%): 35 USCS: CH

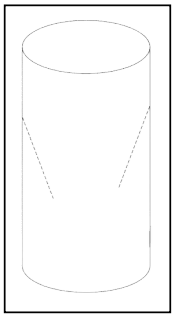
SPECIFIC GRAVITY OF SOLIDS: 2.75 (Assumed) LOAD CELL NO.:

INITIAL SAMPLE DATA	
AVERAGE DIAMETER (in.):	2.86
HEIGHT (in.):	5.78
HEIGHT TO DIAMETER RATIO:	2.02
WET UNIT WEIGHT (pcf):	117.1
DRY UNIT WEIGHT (pcf):	92.8
VOID RATIO:	0.85
MOISTURE CONTENT (%)*:	26.2
DEGREE OF SATURATION (%):	84.8

FAILURE DATA***	
MOISTURE CONTENT AFTER FAILURE (%)**:	**26.4**
AVERAGE RATE OF AXIAL STRAIN TO FAILURE (%/min.):	**1.0**
AXIAL STRAIN AT FAILURE (%):	**6.2**
PRINCIPAL STRESS DIFFERENCE AT FAILURE, $\sigma_1 - \sigma_3$ (psi):	**22.6**
MINOR PRINCIPAL STRESS AT FAILURE, σ_3 (psi):	**2.3**
MAJOR PRINCIPAL STRESS AT FAILURE, σ_1 (psi):	**24.9**
UNDRAINED COMPRESSIVE STRENGTH, U_u (psf):	**3,250**
UNDRAINED SHEAR STRENGTH, s_u (psf):	**1,625**
LIMITING UNDRAINED COMP. STRESS @ 10% STRAIN (psf):	**N/A**



FAILURE SHAPES



REMARKS :

* Initial moisture content determined from sample cuttings.
** Final moisture content determined from entire sample.
*** Failure stress values have been corrected for membrane effects.

UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST ON COHESIVE SOILS
ASTM D2850

CLIENT : ARCH 1010 DATE: 3/22/2024
PROJECT NO.: J043641.01
PROJECT: Wynne High School New Campus, Wynne, AR
LOCATION: Wynne, AR

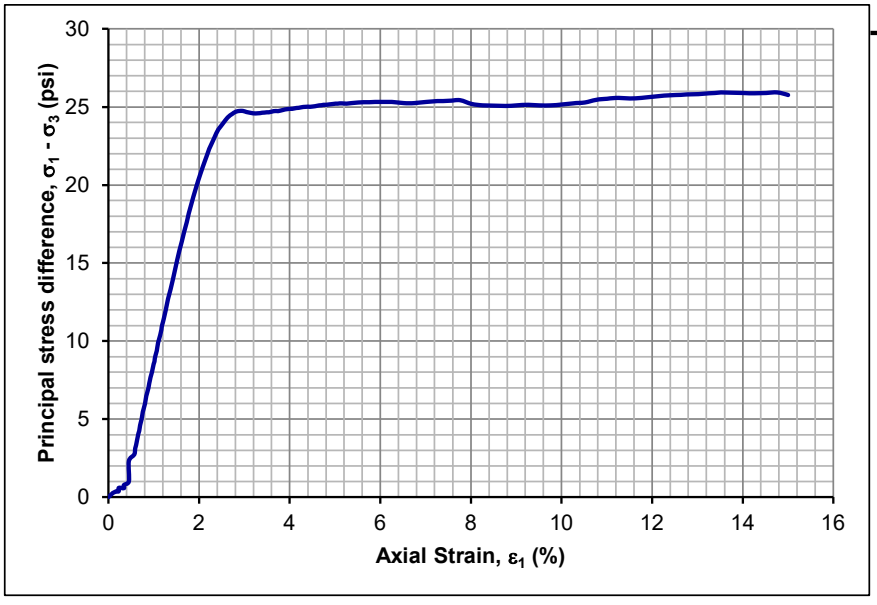
BORING NO.: B-10 SAMPLE NO.: ST-3 DEPTH (ft.): 6.0-8.0
SAMPLE OBTAINED BY: Shelby Tube CONDITION: Undisturbed
SAMPLE DESCRIPTION: Brown Lean Clay

LIQUID LIMIT (%): 47 PLASTIC LIMIT (%): 21 PLASTICITY INDEX (%): 26 USCS: CL

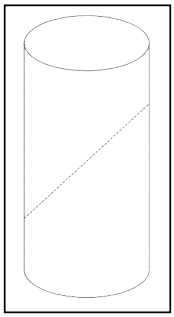
SPECIFIC GRAVITY OF SOLIDS: 2.75 (Assumed) LOAD CELL NO.:

INITIAL SAMPLE DATA	
AVERAGE DIAMETER (in.):	2.84
HEIGHT (in.):	5.74
HEIGHT TO DIAMETER RATIO:	2.02
WET UNIT WEIGHT (pcf):	121.1
DRY UNIT WEIGHT (pcf):	96.1
VOID RATIO:	0.79
MOISTURE CONTENT (%)*:	26.0
DEGREE OF SATURATION (%):	90.9

FAILURE DATA***	
MOISTURE CONTENT AFTER FAILURE (%)**:	**25.7**
AVERAGE RATE OF AXIAL STRAIN TO FAILURE (%/min.):	**1.0**
AXIAL STRAIN AT FAILURE (%):	**14.8**
PRINCIPAL STRESS DIFFERENCE AT FAILURE, $\sigma_1 - \sigma_3$ (psi):	**25.9**
MINOR PRINCIPAL STRESS AT FAILURE, σ_3 (psi):	**4.1**
MAJOR PRINCIPAL STRESS AT FAILURE, σ_1 (psi):	**30.0**
UNDRAINED COMPRESSIVE STRENGTH, U_u (psf):	**3,730**
UNDRAINED SHEAR STRENGTH, s_u (psf):	**1,865**
LIMITING UNDRAINED COMP. STRESS @ 10% STRAIN (psf):	**3,620**



FAILURE SHAPES



REMARKS :

* Initial moisture content determined from sample cuttings.
** Final moisture content determined from entire sample.
*** Failure stress values have been corrected for membrane effects.

UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST ON COHESIVE SOILS
ASTM D2850

CLIENT : ARCH 1010 DATE: 3/26/2024
PROJECT NO.: J043641.01
PROJECT: Wynne High School New Campus, Wynne, AR
LOCATION: Wynne, AR

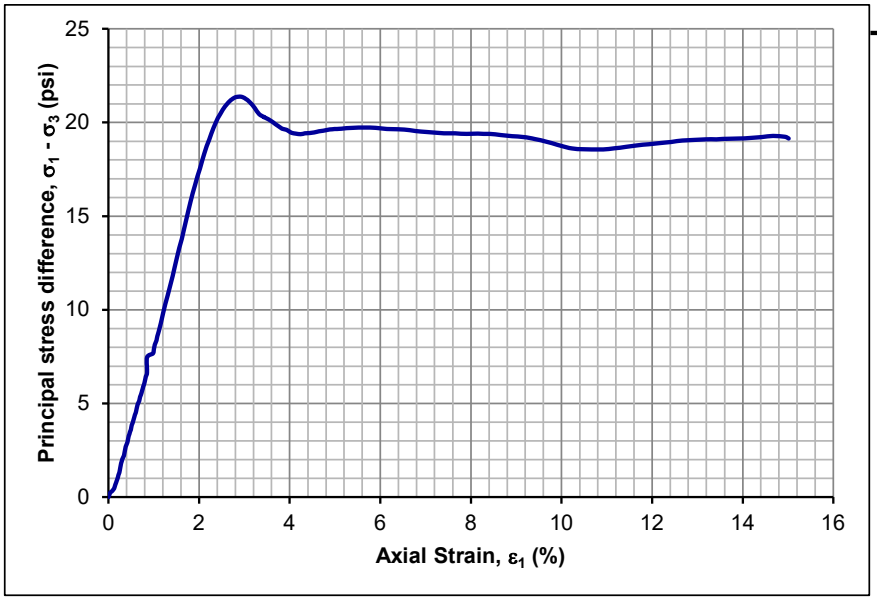
BORING NO.: B-11 SAMPLE NO.: ST-5 DEPTH (ft.): 10.0-12.0
SAMPLE OBTAINED BY: Shelby Tube CONDITION: Undisturbed
SAMPLE DESCRIPTION: Brown Lean Clay

LIQUID LIMIT (%): 40 PLASTIC LIMIT (%): 19 PLASTICITY INDEX (%): 21 USCS: CL

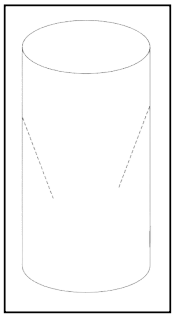
SPECIFIC GRAVITY OF SOLIDS: 2.75 (Assumed) LOAD CELL NO.:

INITIAL SAMPLE DATA	
AVERAGE DIAMETER (in.):	2.86
HEIGHT (in.):	5.72
HEIGHT TO DIAMETER RATIO:	2.00
WET UNIT WEIGHT (pcf):	116.3
DRY UNIT WEIGHT (pcf):	91.0
VOID RATIO:	0.89
MOISTURE CONTENT (%)*:	27.8
DEGREE OF SATURATION (%):	86.3

FAILURE DATA***	
MOISTURE CONTENT AFTER FAILURE (%)**:	**28.7**
AVERAGE RATE OF AXIAL STRAIN TO FAILURE (%/min.):	**1.0**
AXIAL STRAIN AT FAILURE (%):	**2.9**
PRINCIPAL STRESS DIFFERENCE AT FAILURE, $\sigma_1 - \sigma_3$ (psi):	**21.4**
MINOR PRINCIPAL STRESS AT FAILURE, σ_3 (psi):	**6.4**
MAJOR PRINCIPAL STRESS AT FAILURE, σ_1 (psi):	**27.8**
UNDRAINED COMPRESSIVE STRENGTH, U_u (psf):	**3,080**
UNDRAINED SHEAR STRENGTH, s_u (psf):	**1,540**
LIMITING UNDRAINED COMP. STRESS @ 10% STRAIN (psf):	**N/A**



FAILURE SHAPES



REMARKS :

* Initial moisture content determined from sample cuttings.
** Final moisture content determined from entire sample.
*** Failure stress values have been corrected for membrane effects.

SECTION 02 41 00
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Abandonment and removal of existing utilities and utility structures.

1.02 REFERENCE STANDARDS

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

PART 2 PRODUCTS

2.01 MATERIALS

A. Fill Material: as specified.

PART 3 EXECUTION

3.01 SCOPE

A. Remove necessary building components of the existing building and site as to accomplish the new work.

B. Remove paving and curbs as required to accomplish new work.

C. Remove all other paving and curbs within site boundaries.

D. Remove all foundation walls and footings.

E. Remove concrete slabs on grade.

F. Remove all items that conflict with new construction.

G. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as specified.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Use of explosives is not permitted.
   3. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   4. Provide, erect, and maintain temporary barriers and security devices.
   5. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
   6. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   7. Do not close or obstruct roadways or sidewalks without permit.
   8. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.

B. Protect existing structures and other elements that are not to be removed.
   1. Provide bracing and shoring.

2. Prevent movement or settlement of adjacent structures.
3. Stop work immediately if adjacent structures appear to be in danger.

C. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

D. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.

E. Perform demolition in a manner that maximizes salvage and recycling of materials.

F. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

G. Saw cut or core drill penetrations in existing structure.

H. Notify the building owner to the west of the Demolition Schedule.

3.03 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

3.04 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction are based on the Owner provided survey and the Architect’s field measurements.
   1. Verify that construction arrangements are as shown.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.

C. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.

D. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   3. Verify that abandoned services serve only abandoned facilities before removal.

4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.

E. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
   4. Patch as specified for patching new work.

F. Engage the services of a structural engineer licensed in the State of Tennessess to assess the existing wood trusses, rafters, and other existing framing members that are to be removed. These services shall provide means and methods for safe removal and/or replacement.

3.05 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site daily.

B. Remove from site all materials not to be reused on site; do not burn or bury.

C. Leave site in clean condition, ready for subsequent work.

D. Clean up spillage and wind-blown debris from public and private lands.

E. Burning is not allowed.

END OF SECTION

SECTION 024119

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Selective demolition and removal of selected site elements.
2. Abandonment and removal of existing utilities and utility structures.

B. Related Requirements:

1. Section 312000 – Earthwork

C. References

1. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.
2. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2004.

1.2 SUBMITTALS

A. Site Plan: Showing areas for temporary construction and field offices.

B. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.

1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
2. Identify demolition firm and submit qualifications.
3. Include a summary of safety procedures.

C. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.3 QUALITY ASSURANCE

A. Demolition Firm: Company specializing in the type of work required.

1.4 PROJECT CONDITIONS

A. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

PART 2 - PRODUCTS
PART 3 - EXECUTION

3.1 SCOPE

A. Remove paving and curbs as required to accomplish new work.

B. Remove other items indicated, for salvage, relocation, and recycling.

C. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as required so that required rough grade elevations do not subside within one year after completion.

3.2 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.

1. Obtain required permits.
2. Comply with applicable requirements of NFPA 241.
3. Use of explosives is not permitted.
4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
5. Provide, erect, and maintain temporary barriers and security devices.
6. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
7. Do not close or obstruct roadways or sidewalks without permit.
8. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
9. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from the Owner.

C. Protect existing structures and other elements that are not to be removed.

1. Provide bracing and shoring.
2. Prevent movement or settlement of adjacent structures.
3. Stop work immediately if adjacent structures appear to be in danger.

D. Hazardous Materials: Comply with 29 CFR 1926 and state and local regulations.

E. Perform demolition in a manner that maximizes salvage and recycling of materials.

1. Dismantle existing construction and separate materials.
2. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

F. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.3 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to the owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to the owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

I. Coordinate re-location or modifications to all utilities affected by new access street tie ends to any public or private drives and or streets.

3.4 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.

1. Verify that construction and utility arrangements are as shown.
2. Report discrepancies to landscape architect before disturbing existing installation.
3. Beginning of demolition work constitutes acceptance of existing conditions.

B. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.

C. Remove existing work as indicated and as required to accomplish new work.

1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
2. Remove items indicated on drawings.

D. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.

1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components

2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
3. Verify that abandoned services serve only abandoned facilities before removal.
4. Remove abandoned pipe, ducts, conduits, and equipment; remove back to source of supply where possible, otherwise cap stub and tag with identification.

E. Protect existing work to remain.

1. Prevent movement of structure; provide shoring and bracing if necessary.
2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.
4. Patch as specified for patching new work.

3.5 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Remove from site all materials not to be reused on site.

C. Leave site in clean condition, ready for subsequent work.

D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 03 35 43
POLISHED CONCRETE FINISHING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Concrete polishing including the following:
   1. Grinding and honing concrete surface to receive pure reactive colloidal silica concrete densifier.
   2. Application of pure reactive colloidal silica concrete densifier.
   3. Progressively refining, polishing of the densified concrete surface.
   4. Application of polished concrete protective treatment.

1.2 REFERENCES

A. American Society of Concrete Contractors (ASCC) Subgroup - Concrete Polishing Council (CPC) Polished Concrete Definition: D 100.1.

B. American National Standard Institute National Floor Safety Institute (ANSI/NSF):
   1. ANSI/NSFI B101.1 - Test Method for Measuring Wet SCOF of Common Hard-Surface Floor Materials.

C. ASTM International (ASTM):
   1. ASTM C1028 - Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method.
   2. ASTM C1353 - Standard Test Method for Abrasion Resistance of Dimension Stone Subjected to Foot Traffic Using a Rotary Platform, Double-Head Abraser.
   3. ASTM D523 - Standard Test Method for Specular Gloss.
   4. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
   5. ASTM E96/96M Method B (Water Method) - Standard Test Methods for Water Vapor Transmission of Materials.
   6. ASTM G154 - Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Meeting: Convene before the start of work on new concrete slabs, patching of existing concrete slabs, and start of application of concrete finish system.
   1. Require attendance of parties directly affecting work of this section, including the Owner's Representative, Contractor, Architect, concrete installer, and surface treatment/polishing contractor. Meeting should only convene when required parties are present.
   2. Review the Following:
      a. Physical requirements of completed concrete slab and slab finish.
      b. Locations and time of test areas.
      c. Protection of surfaces not scheduled for finish application.
      d. Surface preparation.
      e. Application procedure.

f. Quality control.
g. Cleaning.
h. Protection of finish system.
i. Coordination with other ongoing work.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Shop Drawings: Indicate information on shop drawings as follows:
1. Layout including dimensions and floor grinding schedule.
2. Plan view of floor and joint pattern layout.
3. Areas to receive colored surface treatment.
4. Hardener, sealer, densifier identified in notes.

C. Product Data: Submit product data, including manufacturer's product data sheets, for specified products.
1. Safety Data Sheets (SDS).
2. Preparation and concrete grinding procedures.
3. Colored Concrete Surface, Dye Selection Guides.

D. VOC Certification: Submit certification that products furnished comply with regulations controlling use of volatile organic compounds (VOC).

E. Certificates:
1. Letter by manufacturer stating that installer is listed applicator of specified products, and has completed the necessary training programs.

F. Floor protection plan.

G. Warranty: Submit warranty documents specified.

H. Operation and Maintenance Data: Submit operation and maintenance data for installed products.
1. Manufacturer's instructions on maintenance renewal of applied treatments.
2. Protocols and product specifications for joint filing, crack repair and/or surface repair.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:
1. Applicator to be familiar with specified requirements and methods needed for proper performance of work of this section. Must have available proper equipment to perform work within scope of this project on a timely basis. Applicator should have successfully performed a minimum of 4 projects of similar scope and complexity.

B. Concrete finishing components and materials shall be from single manufacturer.

C. Manufacturer Qualifications:
1. Manufacturer capable of providing field service representation during construction and approving application method.
2. Manufacturer shall have a minimum 5 years of experience in manufacturing components similar to or exceeding requirements of project.

D. Mock-Ups: On site, prior to the start of the polished concrete finishing process.
1. Require attendance of parties directly affecting work of this Section, including

the Contractor, Architect, applicator, and Owner's Representative.
2. Notify the above parties one week in advance of date and time when mock-up will be completed.
3. Demonstrate the materials, equipment and application methods to be used for work specified herein in three pre-approved locations approximately 50 sq ft (4.645 sq m) in area or as directed by Architect.
4. Retain approved mock-up during construction as a standard for judging the completed work. Areas may remain as part of the completed work.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original containers, with seals unbroken, bearing manufacturer labels indicating brand name and directions for storage.

B. Store concrete hardener/densifier and surface protectant treatment in environment recommended on published manufacturer's product data sheets.
1. Store containers upright in a cool, dry, well-ventilated place, out of the sun with temperature between 40 and 100 degrees F (4 and 38 degrees C).
2. Protect from freezing.
3. Store away from other chemicals and potential sources of contamination.
4. Keep lights, fire, sparks and heat away from containers.
5. Do not drop containers or slide across sharp objects.
6. Do not stack pallets more than three high.
7. Keep containers tightly closed when not in use.

1.7 PROJECT CONDITIONS

A. Environmental limitations:
1. Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting performance and finishing requirements.

B. Close areas to traffic during floor application and after application for time period recommended in writing by manufacturer.

C. Protect the completed slab to prevent damage by the other trades during floor completion.

D. Temperature Limitations:
1. Apply when surface and air temperature are between 40 degrees F (4 degrees C) and 95 degrees F (35 degrees C) unless otherwise indicated by manufacturer's written instructions.
2. Apply when surface and air temperatures are expected to remain above 40 degrees F (4 degrees C) for a minimum of 8 hours after application, unless otherwise indicated by manufacturer's written instructions.

E. Apply when air conditions are calm to minimize surface treatment contacting surface not intended to be finished.

F. Do not apply to frozen substrate. Allow adequate time for substrate to thaw if freezing conditions exist before application.

G. Apply a minimum of 24 hours after rain event. Suspend application when rain is anticipated for a period of 8 hours after application, unless otherwise indicated by manufacturer's written instructions.

H. Temporary Heat: Ambient temperature of 50 degrees F (10 degrees C) minimum.

I. Ventilation: Provide adequate ventilation in confined or enclosed areas in accordance with manufacturer's instructions.

1.8 SEQUENCING

A. Sequence with Other Work: Comply with manufacturer's written recommendations for sequencing construction operations.

1.9 WARRANTY

A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and does not limit, other rights Owner may have under Contract Documents.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Solomon Colors, which is located at: 4050 Color Plant Rd.; Springfield, IL 62702-1060; Toll Free Tel: 800-624-0261; Tel: 217-522-3112; Fax: 800-624-3147; Email: request info (sgs@solomoncolors.com); Web: http://www.brickform.com | https://www.day1finishingaid.com

B. Substitutions: Approved Equal

2.2 MATERIALS

A. Water-based, Colloidal silica blended surfactant used for cutting aid: Product used to extend the life of diamond tooling and minimize concrete surface scratches during the wet-grinding process if requires to cut the concrete cap.
   1. Basis of Design: Lythic Cleaner manufactured by Solomon Colors, Incorporated.
   2. Subject to compliance with the following requirements:
      a. Comply with national, state and district AIM VOC regulations and contains 0.067 oz per gal (0.5 g per L)or less.
      b. Formulated with colloidal silica and cleaning surfactants

B. Penetrating Concrete Densifier: Colloidal silica concrete densifier.
   1. Basis of Design: Lythic Densifier or Lythic Densifier XL manufactured by Solomon Colors, Incorporated.
   2. Subject to compliance with the following requirements:
      a. Abrasion Resistance: Greater than 60 percent improvement over untreated samples when tested in accordance with ASTM C1353 or ASTM C779
      b. Coefficient of Friction: Greater than 0.60 dry, Greater than 0.60 wet when tested in accordance with ASTM C1028.
      c. Adhesion: Greater than10 percent increase in pull-off strength when compared to an untreated sample when tested in accordance with ASTM D4541.
      d. UV Stability: No degradation or yellowing of material when tested in accordance with ASTM G154.
      e. Colloidal silica particles size ranging from 3 to 60 nanometers
      f. Chemical pH no greater than pH10

C. Polished Concrete Protective Treatments:
   1. Polished concrete film forming concrete protector, colloidal silica sealer.

a. Basis of Design: Lythic Protector manufactured by Solomon Colors, Incorporated.
b. Subject to compliance with the following requirements:
1) Contain reactive colloidal silica
2) Comply with national, state and district AIM VOC regulations.
3) Achieve ' High Traction Range' readings when tested in accordance with ANSI B101.1.
4) Coefficient of Friction: Greater than 0.60 dry, greater than0.60 wet when tested in accordance with ASTM C1028.
5) Adhesion: : Greater than 10 percent increase in pull-off strength when compared to an untreated sample when tested in accordance with ASTM D4541.
6) UV Stability: No degradation or yellowing of material when tested in accordance with ASTM G154.

D. Polished Concrete After Treatments:
1. Polished concrete film forming concrete protector, colloidal silica sealer.
a. Basis of Design: Lythic Cleaner manufactured by Solomon Colors, Incorporated.
b. Subject to compliance with the following requirements:
c. Comply with national, state and district AIM VOC regulations and contains 0.067 oz per gal (0.5 g per L) or less.

2.3 EQUIPMENT

A. Auto Scrubber Machine: For cleaning operations.

B. Hand Grinder or stand-up edger for edge grinding/polishing.

C. Grinding/Polishing Equipment:
1. Dry grinding/polishing machines shall include a dust extraction system, including HEPA filtration vacuum.

D. Diamond Segments:
1. Use heads from the same manufacturers throughout the entirety of the project.

E. Diamond Heads Types:
1. Metal Diamonds: 16 or 200.
2. Hybrid Style Diamonds: 30 or 100.
3. Resin, Phenolic or Ceramic Bonded Diamonds: 100, 200, 400, 800, 1500, and 3000 (Grit range will depend on individual tooling manufacturers system).

F. Burnishing Machine and Burnishing Pads to produce specified results.
1. Burnishing Machine: High-speed burnisher, generating pad speeds of 1,500 RPM or higher, as recommended by protective treatment manufacturer. Dust skirt must be installed at time of work.
2. Burnishing Pads: as recommended by protective treatment manufacturer.
a. White Burnishing Pad, non-abrasive.
b. Abrasive diamond burnishing pads selective grades 200, 400, 600, 800, 1000, 1500, 3000

PART 3 EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions:

1. Verify that concrete substrate conditions, which have been previously installed under other sections or contracts, are acceptable for product installation in accordance with manufacturer's instructions prior to installation of concrete finishing materials.

B. Ensure surfaces are clean and free of dirt and other foreign matter harmful to performance of concrete finishing materials.

C. Examine surface to determine soundness of concrete for polishing.

D. Do not begin installation until substrates have been properly prepared. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Repair, patch and fill cracks, voids, defects and damaged areas in surface as approved by the Architect. Allow repair materials to cure completely before carrying out additional work, grinding or product application.

B. Variations in substrate texture and color will affect final appearance, should be corrected prior to application of colloidal silica concrete densifier, refined polishing stages and protective treatments.

C. Protect surrounding areas prior to application. If product is accidentally sprayed or spilled to adjacent surfaces, flush with water immediately before material dries.

D. Seal open joints in accordance with Section 07 90 00.

E. Apply specified sealants and caulking and allow complete curing before application of penetrating colloidal silica concrete densifier.

3.3 CONCRETE GRINDING, HONING, AND POLISHING

A. Adhere to industry standard grinding, honing, and polishing procedures for dry and wet grinding and honing. (Reference ASCC - Concrete Polishing Council CPC Polished Concrete Definition: D 100.1)

B. Scrub and rinse slab surface with clean water and vacuum with auto-scrubber between and after final passes.

C. Sequential progression of diamond tooling steps shall be required and limited to no more than double the grit value of the previous diamonds used.

D. Overlap adjacent passes by 25 percent.

E. Perform each pass perpendicular to the other pass north/south then east/west; multiple passes may be needed.

F. Progressively grind, hone and polish the slab surface utilizing approved diamond segments as necessary to produce finishing requirements.
   1. Grout Coat material to fill gaps, voids and pop-outs during grinding operation per manufacturer's published recommendations.
   2. Apply water-based, Colloidal Silica blended surfactant cutting aid during the

initial wet grinding process per manufacturer's published recommendations. (Typically during any metal diamond tooling stages and only if wet grinding is required).

3.4 APPLICATION OF COLLOIDAL SILICA CONCRETE DENSIFIER

A. Apply Colloidal Silica concrete densifier at the rate of 350 to 650 square feet per gallon with a low-pressure sprayer. (Application stage can range from 100-grit metal tooling to 400-grit resin tools depending on the concrete condition).

B. Apply sufficient material to the point of saturation keeping concrete surface wet for 5 to 15 minute period, without producing puddles.

C. Allow treated surface to gel and dry. (Do not remove gel during reaction, it will not leave a residue and will not crystalize on the surface)

D. Continue progressively polishing floor with required resin diamonds as necessary to produce desired final finish.

E. Repeat step (A) Applying Colloidal Silica concrete densifier as needed to harden excessively soft concrete surfaces.

3.5 APPLICATION OF POLISHED CONCRETE PROTECTIVE TREATMENTS:

A. Application Polished concrete gloss film forming concrete protector, colloidal silica sealer:
   1. Apply per manufacturer's published recommendations to clean, dry slab at the completion of mechanically polishing the slab surface.
   2. Lightly wet a clean microfiber mop or cotton pad with protective treatment and wring out excess, leaving the pad damp.
   3. Working from one control joint to another, apply a light, fine spray of protective treatment to a small section of the floor using a clean, pump-up sprayer fitted with a 0.5 gpm spray tip or fog sprayer, at an estimated coverage rate of 1200 to 1800 square feet per gallon.
   4. Using the damp microfiber mop or cotton pad with firm downward pressure, immediately spread the protective treatment to produce an even thin coating. Spread the product as far as possible while maintaining a wet edge. Properly applied, protective treatment dries quickly. Stop spreading once drying begins. Avoid overlapping.
   5. Allow to dry tack free, typically 20 to 60 minutes.
   6. Once dry, high- speed burnish slab surface fitted with manufacturer recommended burnishing pad to increase gloss and to help the treatment fuse and bond with the concrete for increased durability and longevity. (Burnish between coats if multiple applications are required.)
   7. Repeat above steps 1 through 6, as necessary for additional applications of protective treatment, to achieve desired final finish (Not exceeding 4 coats).

B. Application of interior high performance sealer high gloss, film forming sealer:
   1. Mix interior high performance sealer per manufacturer's instructions.
   2. Apply to clean, dry slab at the completion of mechanically polishing no higher than 800-grit. (200-grit to 800-grit produces optimum surface preparation for chemical bond. Ensure scratch pattern is not visible before application)
   3. Lightly wet a lint free short nap paint roller with interior high performance sealer and remove excess, leaving primed paint roller.
   4. Roll out interior high performance sealer using minimal downward force. Evenly roll the interior high performance sealer without leaving overlap lines

at an estimated coverage rate of 1000 to 1500 square feet per gallon. Working from one control joint to another.
5. Maintain a thin, even coating and wet edge. Do not over apply.
6. Allow 4-6 hours before of dry time before a second application is applied (Only re-coat if needed) Repeat steps 1 through 4 for re-coat application.
7. To increase gloss, wait at least 12 to 24 hours after the final coat is applied, then use a high- speed burnisher fitted with a burnishing pad. Burnish at a slow walking pace.

3.6 SLAB PROTECTION

A. Protect finished floors to prevent damage including staining, gouges and scratching by construction traffic and activities until possession.

B. Do not drag or drop equipment or material across the slab which will scratch or chip it.

C. Inspect tires for debris prior to use on slab. Remove embedded items which may cause damage to floor slab.

D. Clean up spills on slab immediately. Provide cleaning chemicals and absorptive materials.

E. Develop a concrete protection procedure which addresses the following procedures:
1. Communication of protection plan to subcontractors and vendors.
2. Procedures for cleaning up slab spills, including use of and availability of cleaning chemicals and absorptive materials at Site.

F. Provide a clean slab surface using concrete maintenance cleaner within an auto scrubber, equipped with soft nylon brushes, in accordance with manufacturer's published recommendations.

3.7 FINISHING REQUIREMENTS

A. Appearance:
1. Interior exposed finished slab areas must consist of the following:
a. Slab surface must meet the desired sheen, as discussed in Pre-Installation meeting and be consistent with approved Mock-up.
b. Slab surface must have a consistent look and exhibit a finish that has no evidence of streaking or burnish marks.
c. White residue or hazy appearance is not acceptable.
d. Exposure of aggregate beyond Concrete Polishing Council Class is not acceptable.
1) Aggregate Exposure Class: C-Medium Aggregate.
2. Interior exposed finished slab areas must consist of the following Concrete Polishing Council Gloss Level:
a. Finished Gloss Level 2: Satin Gloss Appearance.

3.8 ADJUSTMENTS

A. Re-finish those areas not meeting specified gloss levels per mock-up.

3.9 FINAL CLEANING

A. Upon completion, remove surplus and excess materials, rubbish, tools and equipment.

3.10 PROTECTION

A. Protect installed product from damage during construction in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 04 20 00
UNIT MASONRY

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included: Furnish labor, tools, scaffolding, and required equipment, and materials for masonry construction specified and required to provide high quality masonry workmanship.

1.02 RELATED DOCUMENTS

A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are located in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

A. In accordance with Section 01 3000.

B. Substitutions will not be considered prior to the award of the General Contract.

1.04 QUALITY ASSURANCE

A. Qualifications of Workmen:
1. For actual cutting and placing of masonry units, use skilled journeyman masons thoroughly experienced with materials and methods specified and thoroughly familiar with design requirements.
2. Have one skilled journeyman mason present at all times during execution of work of this Section who shall personally direct and execute this portion of the Work.

1.05 SAMPLE PANELS

A. Erect a sample panel for each of the following masonry materials required for this project:
1. Face Brick: include accent colors and special shapes
2. CMU: include special shapes, sills, corners and install a typical Control Joint at the center of the panel

B. Each sample panel is to be 6' long by 4' high. Use full size units to show color range, texture, bond, profile of joints, and workmanship. After approval, panel will be the standard for minimum workmanship requirements. Do not remove panel until authorized by Architect.

PART 2 - PRODUCTS

2.01 MORTAR MATERIALS

A. Acceptable Manufacturer: SPEC MIX, Inc., 1-888-773-2649, or approved equal.

B. Integral Water-Repellent Masonry Mortar: SPEC MIX Integral Water-Repellent (IWR) Masonry Mortar is a dry, preblended mortar mixture containing Portland cement and hydrated lime or masonry or mortar cement, dried masonry sand and dry SPEC MIX Integral Water-Repellent Mortar Admixture.
1. Mortar Types: M, S and N
2. Applicable Standards: C 91, C 144, C 150, C 207, C 270, C 476, C 595, C 780, C 979, C 1072, C 1329, C 1384, E 514, ACI 530.1, IMIAC.
3. Omit Integral Water Repellant at interior applications.

C. Provide integral colorant where required in color to be selected by Architect.

D. Water: Clean and free from deleterious acids, alkalis, and organic matter.

E. Admixtures: Complying with ASTM 1384.

F. Mortar Schedule:

Building Segment	Mortar Type
Exterior, above grade	
load-bearing	M, S or N
non load-bearing	N
parapet wall	N or S
Exterior, at or below grade	S or M
Interior	
load-bearing	N or S
non load-bearing	N

2.02 ANCHORS AND ACCESSORIES

A. Masonry Ties at continuous rigid insulation sheathing on metal studs, or CMU back-up:
1. Provide 2-Seal Thermal Wing Nut Anchor with SH-Seismic Hook wire pintle and 9 gage reinforcing wire. by Hohman & Barnard or approved equal thermally broken anchor.
2. Thermal Concrete 2-Seal™ Wing Nut at Concrete and CMU conditions
3. Type 304 Stainless Steel Barrel with Polymer Coated Screw
4. Anchor securely through insulation board into substrate using the appropriate manufacturer recommended screw.
5. Spacing not to exceed 16" o.c. each way.

B. Control Joints In Brick Veneer
1. In addition to locations shown on drawings, locate joints so that spacing does not exceed 1.5 times height of wall or 30'-0" o.c.. Verify with Architect prior to placement. Contractor will bear full responsibility for unauthorized placement of joints.
2. At Shelf Angles provide 1/4" thick Dur-O-Wal "Soft-Joint" D/A 2010, or approved equal. Closed cell neoprene material shall conform to ASTM D2056 class RE41 or 2A1.
3. At vertical control joints provide 3/8" thick Dur-O-Wal "Expansion-Joint" D/A 2015, or approved equal. Closed cell neoprene material shall conform to ASTM D2056 class RE41 or 2A1.
4. At exposed face of brick, provide backer rod and sealant in addition to joint.

2.03 CAVITY DRAINAGE SYSTEM

A. Mortar Net USA, Ltd., or approved equal.

B. Mortar Net: 1" thick X 10" high, 90% open and 100% post-consumer recycled HDPE strands free-draining mesh. Use multiple layers to fill the cavity width.

C. Mortar Net Weep Joints: 2.5" X 3.5" X 0.5" recycled polyester with 90% open mesh and bonded with flame retardant adhesive; standard color as selected by Architect.

2.04 MASONRY UNITS

A. Materials: Meet referenced ASTM Standards, with modifications specified herein.

B. Face Brick: Conform to ASTM C 216, Grade SW, Type FBX or ASTM C 652, Grade SW, Type

HBX, Class H40V (except that voids shall not exceed 28%, Face Shell shall be a minimum of 3/4" and dimensional tolerances shall be in accordance with ASTM C 216, Article 10, Table 3, Column B).

1. **PROVIDE CERTIFICATION FROM TESTING AGENCY THAT ALL CRITERIA FROM TABLES 2 AND 3 OF ASTM C216 ARE MET WHEN PRODUCT IS DELIVERED TO JOB SITE.**
2. Size: Modular
3. Color range and texture. Provide products from one of the following:
   a. Hebron
   b. Antique Brick & Block
   c. Acme Brick
4. Match color and texture of face brick in existing building. Submit brick samples proposed for use under this Contract for approval by Architect prior to ordering brick.

2.05 MASONRY CLEANERS

A. Provide products by ProSoCo, Inc., 913-281-2700, or approved equal.

B. Products approved for use are 600 Detergent, Vana Trol or 101 Lime solvent.

C. Consult masonry manufacturer and ProSoCo Technical Service prior to applying any cleaner. Some cleaners are not suited for use on certain masonry units and may cause damage that will be repaired or replaced at Contractor's expense.

2.06 THRU-WALL FLASHING

A. Membrane Flashing: W. R. MEADOWS, INC., 800-342-5976, or approved equal.
   1. Provide "AIR SHIELD" rolled, Self-Adhering Sheet Flashing Membrane: 40 mils thick membrane.

B. Metal Flashing: 24 gage Galvalume Sheet Steel, Aluminum-zinc alloy coating AZ55, meeting ASTM A792.

C. Metal Drip Edge: Hohmann & Barnard Flat Drip Plate (Flush-End). Type 304 Stainless Steel 26 gage.

PART 3 - EXECUTION

3.01 LAYING BRICK

A. Lay each brick with full bed of mortar, **including head joints**. Thoroughly fill where brick comes in contact with anchors, each one being fully grouted in place to attain full, secure anchorage. **Insulation and anchorage for face brick in brick and block walls shall proceed simultaneously with the setting of facing**. Bonds to be accurately preserved.
   1. Lay brick so that manufacturer's logos are not visible.
   2. **LAY BRICK WITH HEAD JOINTS 100% FULL. FAILURE TO FILL HEAD JOINTS FULLY WILL BE GROUNDS FOR REJECTION OF THE WORK.**

B. Lay brickwork to a line and keep each tier plumb, true and level. Build in required anchors and miscellaneous built-in items furnished by other Contractors or by Owner. Cutting of masonry for same afterward will not be allowed. Frames and related work furnished by others to be bedded and pointed up, as required. Cover top of brick with tight boards or tarpaulins when discontinuing work. Lay facebrick with mortar finished using a round tool giving concave joints. Nominal thickness of all joints is 3/8" and uniform. Provide solid facebrick where required in masonry construction to avoid exposure of lighting holes in regular units. Match solid brick to specified facebrick in size, color and texture.

C. Keep cavity clean of mortar droppings and other materials during construction. Strike joints facing cavity flush.

3.02 CONSTRUCTION TOLERANCES

A. Lay masonry units plumb, level and true to line within the tolerances specified.

B. Maximum variation from plumb:
1. In 10 feet: 1/4 inch
2. In 20 feet: 3/8 inch
3. In 40 feet or more: 1/2 inch

C. Maximum variation from level:
1. In any bay or up to 20 feet: 1/4 inch
2. In 40 feet or more: 1/2 inch

D. Maximum variation from linear building lines:
1. In any bay or up to 20 feet: 1/2 inch
2. In 40 feet or more: 3/4 inch

E. Maximum variation in cross-sectional dimensions of columns and thickness of walls from dimensions shown:
1. Minus 1/4 inch
2. Plus 1/2 inch

F. Maximum variation in prepared opening dimensions:
1. Accurate to minus 0 inch
2. Plus 1/4 inch

3.03 INSTALLING THRU-WALL FLASHING

A. Lap material at joints minimum 6" and tightly seal with mastic. Spot bonding of mastic equal to 25% of the flashing area applied at 12 inch intervals is acceptable. Apply mastic by trowel at rate of 50 square feet per gallon unless otherwise shown on the container.
1. Where exposed portions are used as a counter-flashings, lap base flashings at least four inches.
2. Terminate exterior edge beyond face of wall approximately 1/4-inch.
3. Turn back edge up 8 inches unless noted otherwise where flashing terminates in mortar joint or hollow masonry unit joint.
4. Terminate interior raised edge in masonry backup unit approximately 2 inches into unit unless shown otherwise.
5. Where dowels, reinforcing bars and fastening devices penetrate flashing, seal penetration with sealing compound.
6. Coordinate with other work to set in a bed of mortar above and below flashing so that total thickness of the two layers of mortar and flashing are same as regular mortar joint.
7. Where ends of flashing terminate turn ends up 2 inch and fold corners to form dam extending to wall face in vertical mortar or veneer joint.
8. Turn flashing up not less than 8 inches between masonry wythes or behind exterior veneer.

3.04 BUILT-IN ITEMS

A. Build in wood blocks, strips, wedges, frames, loose lintels, miscellaneous iron and other items furnished by other subcontractors and which may be required for properly securing their work.

3.05 FREEZING WEATHER

A. Do not lay masonry when outside air temperature is below 40 degrees F., unless suitable means are provided to heat masonry materials and to protect completed work from freezing for at least 48 hours.

3.06 CLEANING PREMISES

A. Mason Contractor: Remove rubbish and building materials left over from operations under his charge, whenever directed by General Constructor. Premises must be left clear and clean. When buildings are completed, completely remove mortar droppings.

3.07 POINTING AND CLEANING

A. Cut out defective mortar joints. Refill solidly with mortar and tool to match adjacent work.

B. On completion clean exposed masonry, removing foreign material, excess mortar and stains. Apply cleaning solution to sample area of approximately 20 square feet at an inconspicuous location approved by Architect. Use cleaning solution specially manufactured for this purpose, applying in accordance with manufacturer's directions. Drench masonry with clean water before applying solution, and after cleaning, rinse with clean water to remove all traces of solution. Protect materials adjacent to masonry from contact with cleaning solution.

C. High Pressure Water Cleaning: **This method of cleaning will not be allowed on masonry surfaces unless approved by architect and masonry manufacturer.** High pressure water is to be used to saturate the masonry before cleaning takes place and may be used to rinse away cleaning solution and foreign particles after cleaning is complete. Allow mortar to cure for a minimum of seven (7) days before subjecting it to high pressure cleaning. After consulting with Architect and manufacturer for cleaning recommendations, test clean a sample panel of all the materials selected for the work. Apply water at a pressure ranging from 200-300 psi. Provide a flow rate of water between 3 and 6 gallons per minute through a "Fan" type, stainless steel tip dispersing a 25 deg to 50 deg fan spray. Do not use less than 15 deg fan spray tip. Application of acidic cleaning compounds through the high pressure system will not be allowed. Do not apply sealer until masonry is completely dry and cleaning has been reviewed by Architect.

END OF SECTION

SECTION 04 20 10
CONCRETE MASONRY UNITS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included: Furnish labor, tools, scaffolding, and required equipment, and materials for masonry construction specified and required to provide high quality masonry workmanship.

1.02 RELATED DOCUMENTS

A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are located in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

A. In accordance with Section 01 3000.

B. Substitutions will not be considered prior to the award of the General Contract.

1.04 QUALITY ASSURANCE

A. Qualifications of Workmen:
1. For actual cutting and placing of masonry units, use skilled journeyman masons thoroughly experienced with materials and methods specified and thoroughly familiar with design requirements.
2. Have one skilled journeyman mason present at all times during execution of work of this Section who shall personally direct and execute this portion of the Work.

PART 2 - PRODUCTS

2.01 MORTAR MATERIALS

A. Acceptable Manufacturer: SPEC MIX, Inc., 1-888-773-2649, or approved equal.

B. Integral Water-Repellent Masonry Mortar: SPEC MIX Integral Water-Repellent (IWR) Masonry Mortar is a dry, preblended mortar mixture containing Portland cement and hydrated lime or masonry or mortar cement, dried masonry sand and dry SPEC MIX Integral Water-Repellent Mortar Admixture.
1. Mortar Types: M, S and N
2. Applicable Standards: C 91, C 144, C 150, C 207, C 270, C 476, C 595, C 780, C 979, C 1072, C 1329, C 1384, E 514, ACI 530.1, IMIAC.
3. Omit Integral Water Repellant at interior applications.

C. Water: Clean and free from deleterious acids, alkalis, and organic matter.

D. Admixtures: Complying with ASTM 1384.

E. Mortar Schedule:

Building Segment	Mortar Type
Exterior, above grade	
load-bearing	M, S or N
non load-bearing	N
parapet wall	N or S
Exterior, at or below grade	S or M
Interior	
load-bearing	N or S
non load-bearing	N

2.02 ANCHORS AND ACCESSORIES

A. Non-Loadbearing Partition Anchors: Unless otherwise called for on Structural Drawings, provide mesh wall ties, galvanized 16 gage wire 1/2" square mesh, by 20" long. Width to be 3" for 4" block partitions, and 2" less than the nominal width dimension for 6", 8", 10" and 12" block partitions. Install partition anchors where concrete block abuts other walls or partitions. Mesh anchors to occur in alternate joints to miss joint reinforcing.

B. Loadbearing Partition Anchors: Where required, conform to ACI 530.0. Provide 344 Rigid Partition Anchor by Hohman & Barnard, or approved equal, 1/4" thick x 1-1/2" wide x 24" long with ends turned up not less than 2".

C. C.M.U. Joint Reinforcement: Truss or Ladder type, high tensile strength, standard weight No.9 steel rods in 10 ft. lengths, in appropriate width. Vertical spacing not to exceed 16" o.c.

D. Reinforcing Bars: Where shown, Grade 60 conforming to ASTM A 615.

E. Finishes For Metal Accessories
1. Finish metal accessories according to the following requirements as set forth in ASCE6/ACI 530.1:
   a. Joint Reinforcement, Interior Wall: ASTM A641 Class 1
   b. Joint Reinforcement, wire ties or anchors,in exterior walls or interior walls exposed to moist environment: ASTM A153 Class B2
   c. Sheet metal ties or anchors completely embedded in mortar or grout: ASTM A525 Class G60
   d. Wire ties or anchors in interior walls: ASTM A641 Class 3
   e. Sheet metal ties and anchors in exterior walls or interior walls exposed to moist environment: ASTM A153

F. Control Joints In Concrete Masonry Units
1. In addition to locations shown on drawings, locate control joints so that spacing does not exceed 1.5 times height of wall or 30'-0" o.c. for reinforced CMU or 25'-0" o.c. for non-reinforced CMU.
2. Provide preformed gaskets placed in sash grooves of concrete masonry using Dur-O-Wal D/A 2001/2025, or approved equal. Factory extrude from solid section of natural or synthetic rubber conforming to ASTM D-2000 2AA-805, with minimum curometer hardness of not less than 80 when tested in accordance with ASTM D 2240.
3. At exposed face of CMU, provide backer rod and sealant in addition to extruded sash groove control joint.

2.03 MASONRY UNITS

A. Materials: Meet referenced ASTM Standards, with modifications specified herein.

B. Lightweight Concrete Blocks (C33-1) and/or Normal Weight Concrete Blocks (C33):
1. Use nominal 8" x 16" face, thickness required. Conform to ASTM C90 (Latest Edition), for hollow loadbearing concrete masonry units and ASTM C129 (Latest Edition), for hollow non-loadbearing concrete masonry units. Cut blocks as required to form jambs, sills, and closers. Use normal weight blocks for below grade block work and at exterior block work that is exposed to weather. Lightweight block may be used at all other locations unless otherwise stated on Architectural or Structural Drawings. At Contractors expense, provide certification of ASTM C90 and C129 compliance from certified testing laboratory.
2. Provide standard "Sash Block" at locations where control and/or expansion joints are called for in CMU construction. Coordinate with control joint material specified in Section 04 1500.
3. Provide units for fire resistant walls and partitions with fire resistance rating required according to U.L. Design numbers listed on drawings. Furnish rated product units by manufacturer listed in current Building Material List published by Underwriter's Laboratories, Inc. In lieu of the above, units may be furnished on basis of examination and certified report by a recognized testing laboratory, indicating units are equivalent in fire resistance to those furnished by producers listed by Underwriters' Laboratories, Inc. Examination shall cover width, height and length of block, shell web thicknesses, minimum equivalent thickness, compressive strength and type aggregate.
4. Exposed, exterior concrete block must be manufactured with manufacturer's recommended amount of integral water repellant "Dry Block System Block Admix", as manufactured by Grace Construction Products.

C. Reinforced C.M.U. Construction: Conform to the provisions of ANSI A41.2 (NBS Handbook 74) and/or ACI/ASCE 530.

D. Concrete Fill: Fill voids in concrete block where required with 3,000 p.s.i. concrete (unless noted otherwise on structural drawings) using pea gravel for coarse aggregate. Do not use mortar for this purpose.

2.04 MASONRY CLEANERS

A. Provide products by ProSoCo, Inc., 913-281-2700, or approved equal.

B. Products approved for use are 600 Detergent, Vana Trol or 101 Lime solvent.

C. Consult masonry manufacturer and ProSoCo Technical Service prior to applying any cleaner. Some cleaners are not suited for use on certain masonry units and may cause damage that will be repaired or replaced at Contractor's expense.

PART 3 - EXECUTION

3.01 LAYING CONCRETE BLOCK

A. Lay blocks straight, plumb, and in perfect alignment. Protect concrete blocks from weather by covering during storage and after laying. Before using blocks, dry them to moisture content of approximately the average air-dry condition to which finished walls will be exposed. Take care to keep mortar off face surface of exposed blocks. At end of job, clean exposed block walls. Where necessary to fit around wall switches and openings, cut blocks to neat line with power saw. Refer to drawings for spacing and type of reinforcement and anchors required.

B. Lay block in 1/2 bond, with mortar finished using a round tool giving concave joints. Nominal thickness of all joints is 3/8" and uniform.

3.03 CONSTRUCTION TOLERANCES

A. Lay masonry units plumb, level and true to line within the tolerances specified.

B. Maximum variation from plumb:
1. In 10 feet: 1/4 inch
2. In 20 feet: 3/8 inch
3. In 40 feet or more: 1/2 inch

C. Maximum variation from level:
1. In any bay or up to 20 feet: 1/4 inch
2. In 40 feet or more: 1/2 inch

D. Maximum variation from linear building lines:
1. In any bay or up to 20 feet: 1/2 inch
2. In 40 feet or more: 3/4 inch

E. Maximum variation in cross-sectional dimensions of columns and thickness of walls from dimensions shown:
1. Minus 1/4 inch
2. Plus 1/2 inch

F. Maximum variation in prepared opening dimensions:
1. Accurate to minus 0 inch
2. Plus 1/4 inch

3.04 BUILT-IN ITEMS

A. Build in wood blocks, strips, wedges, frames, loose lintels, miscellaneous iron and other items furnished by other subcontractors and which may be required for properly securing their work.

3.05 FREEZING WEATHER

A. Do not lay masonry when outside air temperature is below 40 degrees F., unless suitable means are provided to heat masonry materials and to protect completed work from freezing for at least 48 hours.

3.06 CLEANING PREMISES

A. Mason Contractor: Remove rubbish and building materials left over from operations under his charge, whenever directed by General Constructor. Premises must be left clear and clean. When buildings are completed, completely remove mortar droppings.

3.07 BOND BEAMS

A. Reinforce bond beams as required and fill with 3,000 p.s.i. minimum compressive 28-day strength concrete, unless shown otherwise on structural drawings. Do not use masonry mortar for this purpose.

3.08 POINTING AND CLEANING

A. Cut out defective mortar joints. Refill solidly with mortar and tool to match adjacent work.

B. On completion clean exposed masonry, removing foreign material, excess mortar and stains. Apply cleaning solution to sample area of approximately 20 square feet at an inconspicuous location approved by Architect. Use cleaning solution specially manufactured for this purpose, applying in accordance with manufacturer's directions. Drench masonry with clean water before applying solution, and after cleaning, rinse with clean water to remove all traces of solution.

Protect materials adjacent to masonry from contact with cleaning solution.

C. High Pressure Water Cleaning: **This method of cleaning will not be allowed on masonry surfaces unless approved by architect and masonry manufacturer.** High pressure water is to be used to saturate the masonry before cleaning takes place and may be used to rinse away cleaning solution and foreign particles after cleaning is complete. Allow mortar to cure for a minimum of seven (7) days before subjecting it to high pressure cleaning. After consulting with Architect and manufacturer for cleaning recommendations, test clean a sample panel of all the materials selected for the work. Apply water at a pressure ranging from 200-300 psi. Provide a flow rate of water between 3 and 6 gallons per minute through a "Fan" type, stainless steel tip dispersing a 25 deg to 50 deg fan spray. Do not use less than 15 deg fan spray tip. Application of acidic cleaning compounds through the high pressure system will not be allowed. Do not apply sealer until masonry is completely dry and cleaning has been reviewed by Architect.

END OF SECTION

SECTION 04 8100

UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Allowances: Furnish face brick under the Face Brick Allowance specified in Division 1, Section 01200 "Price and Payment Procedures."

B. Submittals: Samples for face brick.

C. Comply with ACI 530.1/ASCE 6/TMS 602.

D. Mockups: Construct a sample wall panel approximately 48 inches long by 48 inches high to demonstrate aesthetic effects and set quality standards for materials and execution.

E. See Section 07 7920 for Joint Sealants.

PART 2 - PRODUCTS

2.1 MASONRY UNITS

A. Face Brick: ASTM C 216, Grade SW. Type FSB

1. Products: **Brick color and texture as approved by the Owner, Developer, and the Architect.**

2. Size: Modular.

3. Solid brick with exposed surfaces finished for ends of sills and caps.

4. Special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

5. Solid brick with exposed surfaces finished for ends of sills and caps.

B. Concrete Masonry Units: ASTM C90; weight classification “lightweight”

1. See drawings for special shapes required for lintels, corners, jambs, sash, control joints, and other special conditions.

2.2 MORTAR AND GROUT

A. Mortar: ASTM C 270, proportion specification. (Mortar color shall match existing building)

1. Masonry Cement: Do not use masonry cement or plastic cement.

2. Do not use calcium chloride in mortar.

3. For masonry below grade or in contact with earth, use Type **M**.

4. For reinforced masonry, use Type **S**

5. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions, and for other applications where another type is not indicated, use Type **S**.

6. Water-Repellent Additive: For mortar used with decorative concrete masonry units, use product recommended by manufacturer of units.

B. Grout: ASTM C 476 with a slump of 8 to 11 inches.

C. Refractory Mortar: Ground fireclay mortar or other refractory mortar acceptable to authorities having jurisdiction.

2.3 REINFORCEMENT, TIES, AND ANCHORS

A. Steel Reinforcing Bars: ASTM A 615/A 615M, Grade 60.

B. Joint Reinforcement: ASTM A 951

1. Coating: Hot-dip galvanized at both interior and exterior walls.

2. Wire Diameter for Side Rods: W1.7 or 0.148 inch

3. Wire Diameter for Cross Rods: W1.7 or 0.148 inch.

4. For single-wythe masonry, provide either ladder design or truss design.

5. For multi-wythe masonry, provide adjustable (two-piece) tab design or eye-and-pintle design side rods.

C. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins.

D. Veneer Anchors: Two-piece adjustable masonry veneer anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to studs, and acceptable to authorities having jurisdiction.

1. Products:

a. H & B Seismic Anchors

2.4 EMBEDDED FLASHING MATERIALS

A. Laminated Flashing: Copper sheet 5 oz./sq. ft., bonded with asphalt between 2 layers of glass-fiber cloth.

2.5 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded strips complying with ASTM D 1056, Grade 2A1.

B. Preformed Control-Joint Gaskets: Designed to fit standard sash block and to maintain lateral stability in masonry wall; made from styrene-butadiene rubber or PVC.

C. Weep Holes: Rid-O-Mice 2.75”stainless steel weep hole inserts @32” oc or as noted on the drawings.

D. Mortar Net: H & B Mortar Net, high density polyethylene woven into a 90% open mesh. Thickness of net is to match air space thickness.

E. Acidic Masonry Cleaner:

1. Products:

a. Muratic Acid

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cut masonry units with saw. Install with cut surfaces and, where possible, cut edges concealed.

B. Mix units for exposed unit masonry from several pallets or cubes as they are placed to produce uniform blend of colors and textures.

C. Stopping and Resuming Work: Rack back units; do not tooth.

D. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

E. Build non-load-bearing interior partitions full height and install compressible filler in joint between top of partition and underside of structure above.

F. Tool exposed joints slightly concave when thumbprint hard, unless otherwise indicated. Match tooling of adjacent mortar of existing building.

G. Keep cavities clean of mortar droppings and other materials during construction. Strike joints facing cavities flush.

H. Control Joints: 24 ft oc max. and within 24 in. of building corners, not to exceed Masonry Institute of America’s recommendations.

3.2 LINTELS

A. Install steel lintels. Wherever practicable, and not specified in the drawings, each leg shall be 3/8” thick so as to provide continuous and uninterrupted coursing with adjacent units.

B. Minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.3 FLASHING AND WEEP HOLES

A. Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to the downward flow of water in the wall, and where indicated.

B. Place through-wall flashing on sloping bed of mortar and cover with mortar. Seal penetrations in flashing before covering with mortar.

1. Extend flashing 4 inches into masonry at each end and turn up 2 inches to form a pan.

C. Trim wicking material used in weep holes flush with outside face of wall after mortar has set.

3.4 CLEANING

A. Clean masonry as work progresses. Remove mortar fins and smears before tooling joints.

B. Final Cleaning: After mortar is thoroughly cured, remove large mortar particles, scrub, and rinse unit masonry.

1. Wet wall surfaces with water before applying acidic cleaner, then remove cleaner promptly by rinsing thoroughly with clear water.

END OF SECTION

SECTION 05 40 00
COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formed steel stud exterior wall and interior wall framing.

B. Exterior wall sheathing.

C. Formed steel joist framing and bridging.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

B. Section 01 6000 - Product Requirements: Substitution procedures.

C. Section 05 3100 - Steel Decking.

D. Section 06 1000 - Rough Carpentry: Wood blocking and miscellaneous framing.

E. Section 07 2100 - Thermal Insulation: Insulation within framing members.

F. Section 07 2400 - Exterior Insulation and Finish System.

G. Section 07 2500 - Weather Barriers: Weather barrier over sheathing.

H. Section 07 4264 - Metal Composite Material Wall Panels.

I. Section 07 9005 - Joint Sealers.

J. Section 09 2116 - Gypsum Board Assemblies: Lightweight metal framing.

1.03 REFERENCE STANDARDS

A. AISI SG02-1 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2001 with 2004 supplement. (replaced SG-971)

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

C. ASTM C955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases; 2011c.

D. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2008.

E. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010.

F. PS 1 - Structural Plywood; 2009.

G. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings; 1999 (Ed. 2004).

H. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with work of other sections that is to be installed in or adjacent to the metal framing system, including but not limited to structural anchors, cladding anchors, utilities, insulation, and firestopping.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations.

C. Product Data: Provide manufacturer's data on factory-made framing connectors, showing compliance with requirements.

D. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading, welds, and type and location of fasteners, and accessories or items required of related work.
   1. Indicate stud and ceiling joist layout.
   2. Describe method for securing studs to tracks and for welded or bolted framing connections.
   3. Provide calculations for loadings and stresses of framing system, stamped by a Professional Structural Engineer.
   4. Provide details and calculations for factory-made framing connectors, stamped by a Professional Structural Engineer.

E. Manufacturer's Installation Instructions: Indicate special procedures, conditions requiring special attention.

1.06 DESIGN REQUIREMENTS

A. Designer Qualifications: Design framing system under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.

B. Calculate structural properties of framing members in accordance with requirements of AISI North American Specification for the Design of Cold-Formed Steel Structural Members.

C. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, and with minimum three years of experience.

D. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of experience.

E. Design Criteria: Provide completed framing system having the following characteristics:
   1. Design: Calculate structural characteristics of cold-formed steel framing members according to AISI North American Specification for the Design of Cold-Formed Steel Structural Members.
   2. Structural Performance: Design, engineer, fabricate, and erect to withstand specified design loads for project conditions within required limits.
   3. Design Loads: As follows:
      a. Wind and Seismic Loads: 2012 International Building Code, local code requirements and as indicated on structural drawings.
   4. Deflections: Live load deflection meeting the following, unless otherwise indicated:
      a. Exterior Walls: Maximum horizontal deflection under wind load of 1/600 of span.
      b. Design non-axial loadbearing framing to accommodate vertical deflection of 1/360 of the beam span, but not less than 1 inch.
   5. Able to tolerate movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
   6. Able to accommodate construction tolerances, deflection of building structural members and clearances of intended openings.

F. Schedule of Required Design Scope Areas:
   1. Drywall ceilings suspended from structure.
   2. Walls taller than 10 feet above finished floor.
   3. Exterior wall components requiring formed steel framing systems.
   4. Walls and ceilings systems noted on the drawings requiring formed steel framing systems.

1.07 SYSTEM DESCRIPTION

A. Size components to withstand design loads as follows:
   1. EIFS and Aluminum Composite Metal Panel Backup:
      a. Wind and seismic loads per 2012 International Building Code, local codes and AISI's "Standard for Cold-Formed Steel Framing.
      b. Horizontal and Vertical Deflection (calculated on stud capacity alone): Design to permit maximum deflection of 1/360 span.

B. The physical and structural properties published by approved supplier will be accepted; otherwise, these properties must be substantiated by calculations for loading stresses and deflection of the designed framing sealed by a professional engineer.

C. Prior to prefabrication, the contractor shall submit fabrication and erection drawings for review and approval in accordance with Section 01 6000. Indicate component details, framing for openings, bearing, anchorage, temporary bracing, welds, or type and location of mechanical fasteners and accessories or items required of other work for complete installations. Include manufacturer's instructions for securing studs to tracks and for other framing components, include existing framing members and substrates.

D. Design wall system to provide for movement of components without damage, failure of joint seals, undue stress on fasteners or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.

E. Design system to accommodate construction tolerances, deflection of building structural members and clearances of intended openings.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Framing:
   1. Clarkwestern Dietrich Building Systems LLC: www.clarkdietrich.com.
   2. Marino: www.marinoware.com.
   3. The Steel Network, Inc: www.SteelNetwork.com.

B. Framing Connectors and Accessories:
   1. Same manufacturer as metal framing.
   2. Simpson Strong-Tie

2.02 FRAMING SYSTEM

A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.

B. Design Criteria: Provide completed framing system having the following characteristics:
   1. Design: Calculate structural characteristics of cold-formed steel framing members according to AISI North American Specification for the Design of Cold-Formed Steel Structural Members.
   2. Structural Performance: Design, engineer, fabricate, and erect to withstand specified design loads for project conditions within required limits.
   3. Able to tolerate movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
   4. Able to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

C. Shop fabricate framing system to the greatest extent possible.

D. Deliver to site in largest practical sections.

2.03 FRAMING MATERIALS

A. Studs and Track: ASTM C955; studs formed to channel, "C", or "Sigma" shape with punched web; U-shaped track in matching nominal width and compatible height.
   1. Gage, Depth and Moment of Inertia: As required to meet specified performance levels with minimum gage of 18, a minimum depth of 6 inches and a minimum moment of inertial of 1.74 inches to the fourth.
   2. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs or use heavy duty framing stud of web depths indicated, unpunched, one piece member with stiffening flanges and size as indicated on drawings. Heavy duty framing stud to be equal to the HDS Framing System by Dietrich Metal Framing.

3. Gage and depth: As required to meet specified performance levels.
4. Galvanized in accordance with ASTM A653 G90/Z275 coating.

B. Bridging/Spacer Bars: Install and fasten horizontal bridging using standard U-shaped cold rolled channel and clip assembly or pre-notched bracing and bridging bar. Bridging to be equal to Spazzer 5400 Bracing and Bridging Bar by Dietrich Metal Framing.

C. Joists and Purlins: Fabricated from ASTM A 653 steel sheet, with G90/Z275 hot dipped galvanized coating.
1. Base Metal: As required to meet specified performance levels within maximum depths indicated.
2. Gage and Depth: As required to meet specified performance levels.

D. Framing Connectors: Factory-made formed steel sheet, ASTM A653 SS Grade 50, with G60/Z180 hot dipped galvanized coating and factory punched holes.
1. Structural Performance: Maintain load and movement capacity required by applicable code, when evaluated in accordance with AISI North American Specification for the Design of Cold Formed Steel Structural Members.
2. Movement Connections: Provide mechanical anchorage devices that accommodate movement using slotted holes, screws and anti-friction bushings, while maintaining structural performance of framing. Provide movement connections where indicated on the drawings and at the following locations.
a. Where continuous studs bypass elevated floor slab, connect stud to slab in manner allowing vertical and horizontal movement of slab without affecting studs; allow for maximum of 1/360 of beam span or 1 inch.
b. Where top of stud wall terminates below structural floor or roof, connect studs to structure in manner allowing vertical and horizontal movement of slab without affecting studs; allow for maximum of 1/360 of beam span or 1 inch.
c. Where top of stud wall terminates below roof, connect studs to structure in manner allowing vertical and horizontal movement of roof without affecting studs; allow for maximum of 1/360 of beam span or 1 inch.
d. Provide top track preassembled with connection devices spaced to fit stud spacing indicated on drawings; minimum track length of 12 feet.
e. Acceptable Products: Fast Clip manufactured by Dietrich Metal Framing.
3. Fixed Connections: Provide non-movement connections for tie-down to foundation, floor-to-floor tie-down, roof-to-wall tie-down, joist hangers, gusset plates, and stiffeners.

2.04 WALL SHEATHING

A. Wall Sheathing: Glass mat faced gypsum; ASTM C1177/C1177M, square long edges, 5/8 inch Type X fire-resistant.

2.05 ACCESSORIES

A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered, except where minimum thickness is indicated on the drawings; finish to match framing components.

B. Flat strapping, angles, sheets and custom brake-metal formed shapes as required for a complete system.

C. Plates, Gussets, Clips: Sheet Steel, thickness determined for conditions encountered, except where minimum thickness is indicated on the drawings; finish to match framing components.

D. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

E. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.06 FASTENERS

A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized per ASTM A153/A153M.

B. Anchorage Devices: Powder actuated and anchor bolts as indicated on the drawings.

C. Welding: In conformance with AWS D1.1.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces and building framing components are ready to receive work.

B. Verify field measurements and adjust installation as required.

C. Prior to start of installation of metal framing systems, meet at the project site with installers of other work including mechanical, electrical, plumbing and fire sprinkler work. Review areas of potential interference and conflicts and coordinate layout and support provisions for interfacing work.

3.02 INSTALLATION OF STUDS

A. Install components in accordance with manufacturers' instructions and ASTM C1007 requirements.

B. Align floor and ceiling tracks; locate to wall layout unless otherwise noted. Secure in place with fasteners at maximum 24 inches on center. Coordinate installation of sealant with floor and ceiling tracks.

C. Place studs at 16 inches on center; not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks using fastener or welding method.

D. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs. Connect studs to tracks using fastener or welding method.

E. Install load bearing studs full length in one piece. Splicing of studs is not permitted.

F. Install load bearing studs, brace, and reinforce to develop full strength and achieve design requirements.

G. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.

H. Install intermediate studs above and below openings to align with wall stud spacing.

I. Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.

J. Frame both sides of expansion and control joints with separate studs; do not bridge the joint with components of the stud system.

K. Attach cross studs to studs for attachment of fixtures anchored to walls.

L. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

M. Touch-up field welds and damaged galvanized surfaces with primer.

3.03 INSTALLATION OF JOISTS AND PURLINS

A. Install framing components in accordance with manufacturer's instructions.

B. Install level and plumb, complete with bracing and reinforcing as indicated on drawings. Provide not less than 1-1/2 inch end bearing.

C. Make provisions for erection stresses. Provide temporary alignment and bracing.

D. Where required, reinforce joists at interior supports with single short length of joist section located directly over interior support, snap-on shoe, 30% side-piece lapped reinforcement, or other method recommended by joist manufacturer.

E. Place joists at 16 inches o.c.; not more than 2 inches from abutting walls. Connect joists to supports using fastener method.

F. Locate joist end bearing directly over load bearing studs or provide load distributing member to top of stud track.

G. Secure joists to interior support systems to prevent lateral movement of bottom flange.

H. Provide web stiffeners at reaction points.

I. Touch-up field welds and damaged galvanized surfaces with primer.

3.04 WALL SHEATHING

A. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using self-tapping screws.
   1. Provide steel diagonal bracing at corners where required.

3.05 TOLERANCES

A. Maximum framing shall be installed in line, level and plumb, suitable for application of furring and/or finishes.

B. Maximum Variation from True Position: 3/8 inch.

C. Maximum Variation of any Member from Plane: 3/16 inch.

END OF SECTION

SECTION 05 50 00

METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide and/or install fabricated metal items.

1.2 SECTION INCLUDES:

A. Steel framing and supports for countertops.

B. Steel framing and supports for mechanical and electrical equipment.

C. Steel framing and supports for applications where framing and supports are not specified in other Sections.

D. Shelf angles.

E. Metal ladders.

F. Miscellaneous steel trim including steel edgings and loading-dock edge angles.

G. Metal bollards.

H. Loose bearing and leveling plates for applications where they are not specified in other Sections.

I. Metal areaway gratings.

J. Products furnished, but not installed, under this Section:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

1.3 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

1.4 ACTION SUBMITTALS

A. Comply with requirements of applicable Division 01 Sections.

B. Shop Drawings: Show fabrication and installation details for each required metal fabrication except loose lintels, bearing plates, shelf angles and edging angles.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

B. Provide certification that welders to be employed on the Work have satisfactorily passed AWS qualification tests. Certifications shall be current within last 12 months.

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code - Steel."
2. AWS D1.2, "Structural Welding Code - Aluminum."
3. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages and steel weld plates and angles for casting into concrete. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.8 DELIVERY, STORAGE AND HANDLING

A. Comply with requirements of applicable Division 01 Sections.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without pitting, seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36.

B. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

1. Size of Channels: Minimum 1-5/8 by 1-5/8 inches, as indicated.
2. Material: Galvanized steel, ASTM A 653, structural steel, Grade 33, with G90 coating; 0.108-inch nominal thickness.

C. Steel Tubing: Cold formed, ASTM A500; or hot rolled, ASTM A501.

1. For exterior installations or where so noted, use tubing with hot dip galvanized coating per ASTM A53.

D. Steel Pipe: ASTM A53; weight as needed for structural loads, but not less than standard weight (schedule 40).

1. Finish: Galvanized for exterior applications or where indicated.

E. Steel Dowels and Rods: ASTM A36 stainless steel.

F. Concrete Inserts: Anchors of type indicated below fabricated from corrosion resistant materials capable of sustaining without failure the load imposed within a safety factor of 4, as determined by testing per ASTM E488 by a qualified independent testing agency.
   1. Threaded or wedge type; galvanized ferrous castings, either ASTM A47 malleable iron or ASTM A27 cast steel.
   2. Provide bolts, washers and shims as needed; hot dip galvanized coating per ASTM A153.

G. Malleable industrial black iron pipe where used for custom lighting fixtures and millwork supports. Gauge and diameter as indicated on drawings-textured finish.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.

D. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
   1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

E. Machine Screws: ASME B18.6.3.

F. Lag Screws: ASME B18.2.1.

G. Wood Screws: Flat head, ASME B18.6.1.

H. Plain Washers: Round, ASME B18.22.1.

I. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

J. Post-Installed Anchors: [Torque-controlled expansion anchors].
   1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
   2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

K. Toggle Bolts: Tumble-wing type, class and style as required; FS FF-B-588.

2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

E. Non-shrink, Non-metallic Grout: Factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

F. The Volatile Organic Compounds (VOC) content of all Paint must conform to Tennessee Sustainability Guidelines

1. Finish Paint VOC limit is 50 g/L less water
2. Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates VOC limit is 250 g/L less water

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches oc, unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
   1. Fabricate units from slotted channel framing where indicated.
   2. Furnish inserts for units installed after concrete is placed.

C. framing and supports where indicated.

2.7 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches OC, unless otherwise indicated.
   1. Provide mitered and welded units at corners.
   2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

C. Galvanize shelf angles located in exterior walls.

D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.8 METAL LADDERS

A. General: Fabricate ladders for the locations shown, with dimensions, spacings, details and anchorages as indicated.
   1. Comply with ANSI A14.3 and OSHA standards unless otherwise indicated.
   2. For elevator pit ladders, comply with ASME A17.1.

B. Steel Ladders:
   1. Space side rails 18 inches apart unless otherwise indicated.
   2. Space side rails of elevator pit ladders 12 inches apart.
   3. Side rails: Continuous, 1/2-by-2-1/2-inch steel flat bars, with eased edges.
   4. Rungs: 3/4-inch- diameter steel bars.
   5. Fit rungs in centerline of side rails; plug-weld and grind smooth on outer rail faces.
   6. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung.
      a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
         1) IKG Industries, a division of Harsco Corporation; Mebac.
         2) SlipNOT Metal Safety Flooring, a W. S. Molnar company; SlipNOT.
   7. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
      a. Size brackets to support design live and dead loads and to hold centerline of rungs clear of wall minimum 7 inches. Exception: ladders for elevator pits may have 4-1/2 inch clearance.
      b. Extend rails 42 inches above top rung, and return rails to wall or structure unless other secure handholds are provided. If adjacent structure does not extend above top

rung, goose-neck the extended rails back to structure to provide secure ladder access.

8. Galvanize exterior ladders, including brackets and fasteners.
9. Shop prime interior ladders, brackets, and fasteners

2.9 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize exterior miscellaneous steel trim with paint grip finish color as indicated on the drawingsr.

2.10 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 80 steel pipe 1/4-inch wall thickness steel shapes, as indicated on Drawings.

B. Cap bollards with 1/4-inch thick steel plate.

C. Fabricate sleeves for bollard anchorage from steel pipe with 1/4-inch thick steel plate welded to bottom of sleeve. Makes sleeves not less than 8 inches deep and 3/4-inch larger than OD of bollard.

D. Prime bollards with primer specified in Division 09: High-Performance Paint Coatings Paint color as indicated on the drawings.

2.11 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates.

2.12 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches solid bearing unless otherwise indicated.

C. Galvanize loose steel lintels located in exterior walls.

2.13 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.14 DIAMOND PLATE DOOR PROTECTION

A. Fabricate diamond plate from 1/4-inch stainless steel, or, aluminum plate.

B. Grind and ease all edges smooth.

C. Fabricate countersunk holes for screw fastener attachment to doors.

2.15 METAL GRATINGS

A. Gratings: Welded or pressure-locked steel bar gratings conforming to "Standard Specifications for Metal Bar Grating and Metal Bar Grating Treads" published in ANSI/ NAAMM MBG 531 "Metal Bar Grating Manual".
   1. Grating Mark: W-7-4 or P-7-4; bearing bars 7/16 inch o/c and cross bars 4 inches OC.
   2. Bearing Bar Size: 1-1/2 inches by 3/16 inch.
   3. Traffic Surface: Plain.
   4. Finish: Hot-dip galvanized after fabrication.

B. Fabricate cutouts in gratings for indicated penetrations. Arrange layout of cutouts to allow grating removal without disturbing items that penetrate the grating.
   1. Provide hinged access panels as indicated on Drawings.

C. Edge band openings in grating that interrupt 4 or more bearing bars with bars of same material and size as bearing bars.

D. Do not notch bearing bars at supports to maintain elevation.

E. Provide hot-dip galvanized steel anchorage devices suitable for Project applications.

2.16 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.17 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153 for steel and iron hardware and with ASTM A 123 for other steel and iron products.
   1. Iron and Steel Hardware: ASTM A153.
   2. Base Material and Fabrications: ASTM A123.
   3. Assembled Steel Products: ASTM A123.

B. Apply finishes after welding is complete, but before assembly with mechanical fasteners

C. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

D. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

E. Surface Preparation for Priming: Remove scale, rust, dirt, and other loose materials that would impair paint bond before applying primer.
   1. Exterior Fabrications: SSPC-SP6, 'Commercial Blast Cleaning'.

2. Interior Fabrications: SSPC-SP3, 'Power Tool Cleaning'.
3. Remove oil, grease and similar contaminants in accordance with SSPC SP-1 'Solvent Cleaning'.

F. Shop Priming - Method: Apply primer immediately after surface preparation. Comply with SSPC-PA1, 'Paint Application Specification No. 1' to provide uniform dry film thickness of 2.0 mils for each coat. Apply one shop coat to fabrications, except apply 2 coats of paint to surfaces inaccessible after assembly or erection.
1. Use painting methods that result in full coverage of joints, corners, edges and exposed surfaces.
2. Stripe paint corners, crevices, bolts, welds, and sharp edges.

G. Stainless Steel: finish to be coordinated with Architect.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Comply with requirements of applicable Division 01 Sections.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

D. Field Welding: Comply with the following requirements:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

E. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

F. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

G. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

H. Gratings: Attach with mechanical vandal-resistant anchors.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

3.3 INSTALLING PIPE BOLLARDS

A. Cast pipe bollards into concrete or set in pipe sleeves. Plumb bollards in all directions.
   1. Sleeve Installation: Fill annular space between bollard and sleeve solid with grout.

B. Fill bollards solidly with concrete per requirements of Division 03: Cast-in-Place Concrete.

3.4 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
   1. Use non-shrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use non-shrink, nonmetallic grout in exposed locations unless otherwise indicated.
   2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.5 INSTALLATION – SUPPORTS FOR OVERHEAD DOORS AND OPERABLE PARTITIONS.

A. Provide temporary bracing or supports needed for erection loads and stability until permanent supports and connections are completed.

B. Anchor support framing to existing building structure in manner to safely transfer loads from operable partition components to existing structure, to provide stability, and to prevent vibration of assembly during partition operation.

C. Install framing to form rigid, stable assemblies.

D. Provide permanent connections that will not loosen or need adjustment during normal use.

3.6 INSTALLATION – DIAMOND PLATE DOOR PROTECTION

A. Attach diamond plate to doors as scheduled in Division 08 Door and Hardware Schedules and as recommended by door manufacturer.

3.7 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 91 00 Painting and/or Section 09 96 00 High Performance Coatings.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

END OF SECTION

SECTION 05 51 00
METAL STAIRS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel stairs framed with structural sections, with concrete-filled treads.
2. Steel tube railings attached to metal stairs.
3. Steel tube handrails attached to walls adjacent to metal stairs.

B. Related Sections:

1. Division 03: Cast-in-Place Concrete, for concrete fill for stair treads and platforms.
2. Division 04: Unit Masonry, for installation of metal anchors in masonry.
3. Division 05: Cold-Formed Metal Framing, for exterior partition framing supporting metal handrails; Metal Fabrications, for installation of miscellaneous metal anchoring devices.
4. Division 06: Rough Carpentry, for wood blocking for anchoring railings.
5. Division 09: Non-Load Bearing Framing and Furring, for metal backing for anchoring railings; Painting, for finish painting of metal stairs and railings.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design metal stairs, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Uniform Live Load: 100 lbf/sq. ft..
2. Concentrated Load: 300 lbf applied on an area of 4 sq. in..
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
5. Limit deflection of treads, platforms, and framing members to L/180 of span under design loads or 1/4 inch, whichever is less.

C. Structural Performance of Railings: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Handrails and Top Rails of Guards:
   a. Uniform load of 50 lbf/ ft. applied in any direction.
   b. Concentrated load of 200 lbf applied in any direction.
   c. Uniform and concentrated loads need not be assumed to act concurrently.
2. Infill of Guards:
   a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
   b. Infill load and other loads need not be assumed to act concurrently.

D. Seismic Performance: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Component Importance Factor is 1.5.

1.3 DESIGN REQUIREMENTS

A. Headroom: Size beams and other supports to maintain minimum 80 inch headroom at all locations in the stairway.

B. Uniformity of Risers and Treads: Provide stairs with uniform depth tread and uniform height risers between floors, in compliance with authorities having jurisdiction.

1.4 ACTION SUBMITTALS

A. Comply with requirements of applicable Division 01 Sections.

B. Product Data: For metal stairs and the following:

1. Pre-filled (precast) metal-pan stair treads.

C. Sustainability Compliance Submittals:

1. Comply with requirements of the State of Tennessee Sustainability Design Guidelines (SDG).

D. Shop Drawings: Provide a statement of conformance to performance requirements.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include profiles, sizes, connection attachments, welds, anchorages, and accessories.
3. Show locations for anchorage block-outs in concrete and masonry, and anchorage devices to be installed in masonry or concrete under other sections of the Specifications.

E. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified professional engineer.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for stairs and railings.

1. Test railings according ASTM E 894 and ASTM E 935.

1.6 QUALITY ASSURANCE

A. Designer Qualifications: Structural calculations and Shop Drawings shall be prepared by a Professional Engineer registered in Tennessee and experienced in structural design of steel stair systems.

B. Installer Qualifications: Fabricator of metal stairs and related products.

C. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.

1. Pre-assembled Stairs: Commercial class.

D. Welder Qualifications: AWS qualification within 12 months of performance of Work.

E. Welding Standards: Comply with applicable provisions of the following publications:

1. AWS D1.1, "Structural Welding Code - Steel."
2. AWS D1.3, "Structural Welding Code - Sheet Steel."

1.7 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

C. Coordinate locations of hanger rods and struts with other work so that they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.

1.8 DELIVERY, STORAGE AND HANDLING

A. Comply with requirements of applicable Division 01 Sections.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without exposed pitting, seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36.

B. Cold-Formed Steel Tubing: ASTM A 500.

C. Steel Pipe: ASTM A53, Grade B, weight as needed for structural loads, but not less than Schedule 40; black finish.

D. Steel Bars for Grating Treads: ASTM A 36 or steel strip, ASTM A 1011 or ASTM A 1018.

E. Wire Rod for Grating Crossbars: ASTM A 510.

F. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008, structural steel, Grade 25, unless another grade is required by design loads; exposed.

G. Galvanized-Steel Sheet: ASTM A 653, G90 coating, commercial steel, Type B, unless another grade is required by design loads.

2.3 COMPONENTS

A. General: Size components for strength, stability, and required structural performances.

B. Risers, Treads: Sheet steel, minimum 0.067-inch thickness.

C. Landing Deck: Sheet steel, minimum 0.093-inch thickness.

D. Landing Supports: Angle or tube columns with base plate for supporting intermediate landings.

E. Contractor Option: Stairs may be supplied with precast concrete treads and landing units instead of site-cast concrete. Provide units suitable for specified applied finishes.

2.4 FASTENERS

A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.

B. Fasteners: Select fastener type, grade, and class for performance requirements and Project applications.

1. Exposed Fasteners: Flush countersunk screws or bolts.

C. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

D. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.

1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for stairs indicated to be shop primed with zinc-rich primer.

E. Machine Screws: ASME B18.6.3.

F. Lag Screws: ASME B18.2.1.

G. Plain Washers: Round, ASME B18.22.1.

H. Lock Washers: Helical, spring type, ASME B18.21.1.

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Shop Primers: Rust-inhibitive, lead free primer selected for compatibility with finish paint specified in Division 09.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

D. Non-shrink, Non-metallic Grout: Factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

E. Concrete Materials and Properties: Comply with requirements in Division 03: Cast-in-Place Concrete, for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.

F. Welded Wire Fabric: ASTM A 185, 6 by 6 inches, W1.4 by W1.4, unless otherwise indicated.

2.6 PRECAST CONCRETE TREADS

A. Concrete Materials and Properties: Comply with requirements in Division 03: Cast-in-Place Concrete, for normal-weight, ready-mixed concrete with a minimum 28-day compressive strength of 5000 psi and a total air content of not less than 4 percent or more than 6 percent.

B. Reinforcing Wire Fabric: Galvanized, welded wire fabric, 2 by 2 inches by 0.062-inch-diameter wire; comply with ASTM A 185M and ASTM A 82, except for minimum wire size.

2.7 FABRICATION, GENERAL

A. Comply with NAAMM "Metal Stair Manual" except where more stringent requirements are indicated.

B. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

1. Join components by welding unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces.

C. Pre-assembled Stairs: Fit and assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.

D. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

E. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

F. Form exposed work with accurate angles and surfaces and straight edges.

G. Weld connections to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Weld exposed corners and seams continuously unless otherwise indicated.
5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: no evidence of a welded joint.

H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.

1. Form stair tread and landing pans of cold-rolled steel sheet of thickness needed for performance requirements.
2. Directly weld risers and tread pans to stringers on side to receive concrete fill.
3. Reinforce tread and landing pans with steel angles or tees as needed for performance requirements; weld reinforcements to pans and supporting stair framing.
4. Close ends of rolled sections with minimum 3/16 inch steel plate cut to fit section profile and welded in place.
5. Supply components needed for anchorage of stairs. Fabricate anchors and related components of same material and finish as stair assemblies.

2.8 STEEL-FRAMED STAIRS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alfab, Inc.
2. American Stair, Inc.
3. Sharon Companies Ltd. (The).

B. Stair Framing:

1. Fabricate stringers of steel channels.

a. Provide closures for exposed ends of channel stringers.

2. Construct platforms of steel channel headers and miscellaneous framing members as needed to comply with performance requirements.
3. Weld stringers to headers; weld framing members to stringers and headers..

4. Where stairs are enclosed by gypsum board or gypsum board shaft-wall assemblies, provide hanger rods or struts to support landings from floor construction above or below. Locate hanger rods and struts where they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.
5. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

C. Metal-Pan Stairs: Form risers, sub-tread pans, and sub-platforms to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 0.067 inch.

1. Steel Sheet: Uncoated cold-rolled steel sheet unless otherwise indicated.
2. Steel Sheet: Galvanized-steel sheet, where indicated on Drawings.
3. Directly weld metal pans to stringers; locate welds on top of sub-treads where they will be concealed by concrete fill. Do not weld risers to stringers.
4. Shape metal pans to include nosing integral with riser.
5. At Contractor's option, provide stair assemblies with metal-pan sub-treads filled with reinforced concrete during fabrication.
6. Provide sub-platforms of configuration indicated or, if not indicated, the same as sub-treads. Weld sub-platforms to platform framing.
7. Form treads with integral nosing and back edge stiffener. Form risers of same material as treads.
8. Weld steel supporting brackets to stringers and weld treads to brackets.
9. Fabricate platforms with integral nosings matching treads and weld to platform framing.

2.9 STAIR RAILINGS

A. Steel Tube Railings: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.

1. Rails and Posts: 1-1/4-inch diameter top and bottom rails and vertical posts as indicated on Drawings.
2. Picket Infill: 3/4-inch outside diameter pickets spaced less than 4 inches clear, as indicated on Drawings.
3. Intermediate Rail Infill for Roof Guardrail: 1-5/8-inch diameter intermediate rails spaced less than 21 inches clear, as indicted on Drawings.

B. Welded Connections: Fabricate railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: No evidence of a welded joint.

C. Form changes in direction of railings as follows:

1. By bending or by inserting prefabricated elbow fittings.

D. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

E. Close exposed ends of all railing members with prefabricated end fittings.

F. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.

G. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.

1. Connect posts to stair framing by direct welding unless otherwise indicated.
2. For non-galvanized railings, provide non-galvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.

H. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.10 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Shop finish metal stairs and railings after fabrication.

C. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153 for steel and iron hardware and with ASTM A 123 for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
2. Fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

D. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."

E. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

F. Apply one coat of primer to all surfaces except those which are to be field welded or embedded in concrete or masonry.

G. The Volatile Organic Compounds (VOC) content of all Paint must conform to Tennessee Sustainability Guidelines

1. Finish Paint VOC limit is 50 g/L less water
2. Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates VOC limit is 250 g/L less water

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that supporting structure can bear loads imposed by erection and use of stairs, including construction loads.

3.2 INSTALLATION, GENERAL

A. Comply with applicable requirements of Division 01 Sections.

B. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

C. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

D. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

G. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.

H. Place and finish concrete fill for treads and platforms to comply with Division 03: Cast-in-Place Concrete.

I. Install precast concrete treads with adhesive supplied by manufacturer to prevent rocking or making noise when walked on.

3.3 INSTALLING RAILINGS

A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and rail ends to building construction as follows:

1. Anchor posts to steel by welding directly to steel supporting members.
2. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with post-installed anchors and bolts.

B. Attach handrails to wall with wall brackets. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt. Provide bracket with 1-1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.
3. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members, or, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness in accordance with Division 09: Painting.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION

SECTION 05 52 13
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall mounted handrails.

B. Stair railings and guardrails.

C. Ramp railing and guardrails.

D. Free-standing railings at steps.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

B. Section 03 3000 - Cast-in-Place Concrete: Placement of anchors in concrete.

C. Section 09 2116 - Gypsum Board Assemblies: Placement of backing plates in stud wall construction.

D. Section 09 9113 - Exterior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

C. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2014a.

D. ASTM D1187 - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal; 97(2011)e1

E. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2013.

F. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

G. AWS D1.1 - Structural Welding Code - Steel; 2010 w/Errata

H. AWS D1.3 - Structural Welding Coded - Sheet Steel; 2010.

I. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Provide luminous egress path marking product data.

C. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

D. Include plans, elevations, sections and details of metal fabrications and their connections. Show anchorage and accessory items.

E. Provide templates for anchors and bolts specified for installation under other Sections.

F. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by qualified professional engineer, licensed to practice in the state where the project is located, responsible for their preparation.

G. Welding Certificates.

H. Qualification Data: For professional engineer.

1.05 QUALITY ASSURANCE

A. Welding: Quality procedures and personnel according to the following:
   1. AWS D1.1, "Structural Welding Code - Steel."
   2. AWS D1.3, "Structural Welding Code - Sheet Steel."

B. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names or blemishes.

1.06 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on Drawings.

B. Provide allowance for trimming and fitting on site.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E985 and applicable local code.

B. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 50 pounds per linear foot applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E 935.

C. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E 935.

D. Allow for expansion and contraction of members and building movement without damage to connections or members.

E. Dimensions: See drawings for configurations and heights.
   1. Top Rails and Wall Rails: 1-1/2 inches outside diameter.
   2. Grip Rails: 1-1/2 inches outside diameter.
   3. Intermediate Rails: 1-1/2 inches diameter, round.
   4. Posts: 1-1/2 inches diameter, round.
   5. Balusters: 1/2 inch square solid bar.
   6. Wall Brackets: Standard malleable iron, round saddle with three mounting holes, for countersunk fasteners.

F. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are otherwise unavoidable provide flush countersunk fasteners, screws or bolts unobtrusively located; consistent with design of component, except where specifically noted otherwise.
   1. For anchorage to new concrete, provide sleeves cast into concrete, for grouting posts.
   2. For anchorage to existing concrete, core drill concrete, epoxy sleeve in hole for grouting posts.
   3. For anchorage to masonry, provide brackets to be bolted into masonry.
   4. For anchorage to stud walls, provide backing plates, for bolting anchors.
   5. For anchorage to stringers, weld posts to top of stringers. Weld balusters to bottom rail or stringer as indicated on the drawings.

G. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

H. Welding Fittings: No exposed fasteners; cast aluminum.

2.02 STEEL RAILING SYSTEM

A. Steel Pipe: ASTM A 53/A 53M, Grade A Schedule 40, galvanized finish, unless another weight is indicated or required by structural loads.

B. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

C. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.

D. Straight Splice Connectors: Steel concealed spigots.

E. Galvanizing: In accordance with requirements of ASTM A 123.
   1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic.

F. Shop and Touch-Up Primer: Type 1 - Red Oxide, complying with VOC limitations of authorities having jurisdiction.
   1. Alkyd: TNEMEC Series 10-99 or approved equal.
   2. Water Based: Rustoleum 5200 Primer or approved equal.

G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.

H. Nonshrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.03 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to each other and building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

D. Welded Joints:
   1. Exterior Components: Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
   2. Interior Components: Continuously seal joined pieces by continuous welds.
   3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush and hairline. Ease exposed edges to small uniform radius.
   4. End Caps: Weld end caps at each end of handrails; grind smooth.

E. Provide anchors and plates required for connecting railings to structure.

F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.04 STAINLESS STEEL FINISHES

A. Gripping surfaces of handrails and guardrails: Stainless Steel Grade 304, satin finish

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Beginning of installation indicates erector accepts existing conditions.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete with setting templates, for installation as work of other sections.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Anchor railings securely to structure. Provide anchors, plates or angles required for connecting railings to structure.

D. Field weld anchors as indicated on shop drawings. Touch-up welds with primer. Grind welds smooth.

E. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/8 inch.

C. Maximum Out-of-Position: 1/8 inch.

3.05 ADJUSTING AND CLEANING

A. Touch-up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting for touching up shop-painted surfaces.

END OF SECTION

Section 06 10 00
Rough Carpentry

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes all rough carpentry items including, but not limited to:

1. Miscellaneous framing with dimension lumber.
2. Rooftop equipment bases and support curbs.
3. Wood blocking, cants, and nailers, including those associated with roofing and for support and attachment of items to walls.
4. Wood furring.

B. Related Sections: Coordinate work of this Section with work of other sections, including Division-1 Sections as required to properly execute the work and as necessary to maintain satisfactory progress of the work.

1.02 CONTRACTOR'S RESPONSIBILITIES

A. As scope and performance documents, the Drawings and Specifications do not necessarily indicate or describe all the work requiring wood framing, bracing, sheathing, screeds, nailers, lagging, bucks, and blocking for work supported on or recessed into wood frame construction. The Contractor shall ensure that adequate wood framing, bracing, sheathing, screeds, nailers, lagging, bucks, and blocking is installed for support of all items whether indicated or not.

1.03 DEFINITIONS

A. Dimension Lumber: Lumber of two (2) inches nominal or greater, but less than five (5) inches nominal in least dimension.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NLGA: National Lumber Grades Authority.
2. NFPA: National Forest Products Association.
3. SPIB: The Southern Pine Inspection Bureau.
4. WCLIB: West Coast Lumber Inspection Bureau.
5. WWPA: Western Wood Products Association.

1.04 QUALITY ASSURANCE

A. This Section outlines only minimum standards and requirements. Refer to the Drawings, and other specification sections for additional requirements. Bring all conflicts and discrepancies to the attention of the Architect and do not start work until such conflicts and discrepancies are clarified and corrected.

1.05 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments specified to be High-Temperature (HT) type, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

C. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Powder-actuated fasteners.
5. Expansion anchors.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.01 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
3. Provide dressed lumber, S4S, unless otherwise indicated.

2.02 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA C2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood floor plates that are installed over concrete slabs-on-grade.

2.03 FIRE-RETARDANT-TREATED MATERIALS

A. General: Comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood).

1. Use Exterior type for exterior locations and where indicated.
2. Use Interior Type A, High Temperature (HT) for enclosed roof framing, framing in attic spaces, and where indicated.
3. Use Interior Type A, unless otherwise indicated.

B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings, and the following:

1. Framing for raised platforms, if any.
2. Concealed blocking.
3. Plywood backing panels.

2.04 DIMENSION LUMBER FRAMING

A. Maximum Moisture Content: 15 percent.

B. Materials for framing lumber subject to bending stresses such as beams, joists, rafters headers, and other horizontal members shall be Southern Pine No. 2, Kiln Dried (KD), Construction grade minimum, unless a higher grade is indicated on the Structural Drawings.

2.05 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Cants.
5. Furring.
6. Utility shelving.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 15 percent maximum moisture content and the following species, unless indicated otherwise.

1. Mixed southern pine; SPIB.

2.06 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure- preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2.07 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch selected from manufacturer's standard widths to suit width of sill members indicated.

B. Adhesives for Gluing Furring to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

C. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as

its active ingredient.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Do not splice structural members between supports, unless otherwise indicated.

D. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

E. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.
3. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.

F. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

G. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.

H. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

I. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not

fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

3.02 WOOD BLOCKING AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

3.03 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Furring to Receive Plywood: Install 1-by-3-inch nominal size furring horizontally at 24 inches o.c.

C. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal size furring vertically at 16 inches.

3.04 PROTECTION

A. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

SECTION 06 41 00
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specially fabricated cabinet units.

B. Cabinet hardware.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

B. Section 01 4000 - Quality Requirements: Mockup requirements.

C. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

D. Section 08 8000 - Glazing: Glass for casework.

E. Section 12 3600 - Countertops.

1.03 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0; 2016.

C. BHMA A156.9 - American National Standard for Cabinet Hardware; 2010.

D. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2009.

E. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

F. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.

G. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.04 SUBMITTALS

A. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, field verified dimensions, fastening methods, accessory listings, hardware location and schedule of finishes. Indicate requirements for wood blocking.
   1. For each group of casework in a specific room, the shop drawings shall reference the architectural drawing number and room number where the millwork can be found.
   2. Indicate plastic laminate seam locations for each cabinet type.

B. Shop Drawing Level of Detail:
   1. Plan Layout: 1/4" = 1' - 0".
   2. Elevations: 1/2" = 1' - 0".
   3. Vertical and Plan Sections: 3" = 1' - 0".
   4. Details: 3" = 1' - 0".

C. Product Data: Provide data for hardware accessories.

D. Samples:
   1. Submit two sets of samples indicating plastic laminate selection as scheduled, each sample measuring a minimum 2 x 2 inches in size, illustrating finish, color, texture and thickness.
   2. Submit two sets of stained hardwood veneer samples with transparent finish measuring a minimum 6 x 6 inches in size, illustrating finish stain color, texture and sheen. Resubmit as required until approved by the Architect.

E. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.

F. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of experience in this size and scope of work.

1.06 MOCK-UP

A. Section 01400 - Quality Requirements: Mockup requirements.

B. Provide a portable mock-up of typical base cabinet, wall cabinet, and countertop, including hardware, finishes, plumbing accessories, and stile and rail or panel construction .

C. Locate where directed.

D. Mock-up may remain as part of the Work if approved by Architect in advance.

1.07 PRE-INSTALLATION MEETING

A. Convene not less than one week before starting work of this section.
   1. Contractor, casework subcontractor and Architect shall review mock-up, installation procedures, schedules and steps to be taken to protect casework during construction.

B. Contractor shall record minutes of the Pre-installation Meeting and send copies to Owner and Architect.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Section 01600 - Product Requirements: Product storage and handling requirements.

B. Protect units from moisture damage.

C. Use all means necessary to protect materials of this Section before, during and after installation.

1.09 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

1.10 COORDINATION

A. Section 01700 - Execution Requirements: Coordination of project conditions and adjacent construction.

B. Coordinate work as required with plumbing rough-in, electrical rough-in and installation of associated and adjacent components.

C. Coordinate requirements of wood blocking to support cabinet units and countertops. Refer to Section 06100 - Rough Carpentry.

PART 2 PRODUCTS

2.01 GENERAL

A. Casework shall conform to flush overlay design as indicated in the AWI Quality Standards. Horizontal and vertical reveals between all doors and drawers shall be 1/8 inch unless otherwise detailed and 1/4 inch below countertops.
   1. Face frames, where indicated at hardwood and hardwood veneer cabinets, shall be of solid stock materials.
   2. Face frames, where indicated at plastic laminate cabinets, shall be of particle board with laminated plastic finish.
   3. At plastic laminate wall cabinets, horizontal seams in plastic laminate shall not be visible when overhead cabinet doors are closed.
   4. Shop made joints in countertops are allowed only when required length exceeds obtainable laminate length. Such joints shall touch throughout their length and be flush within a tolerance of 0.005 inches. Joints between adjoining tops which must be field assembled shall be shop prepared with tight joints, bolt type connectors.
   5. Backing sheets shall be used on all unexposed cabinet surfaces and on the underside of all countertops.

6. Provide all cutouts for sinks, fixtures and fittings located in casework. See casework plumbing, mechanical and electrical drawings.

2.02 CABINETS

A. Quality Grade: Unless otherwise indicated provide products of quality specified by AWI//AWMAC/WI (AWS) for Premium Grade.

B. Wood Veneer Faced Cabinet:
   1. Exposed Surfaces: HPVA, HP-1 Grade A. Birch, plane sliced, and match book.
   2. Semi-Exposed Surfaces: HPVA HP-1 Grade B, species to match exposed, plain sliced, random-matched.
   3. Concealed Surfaces: Manufacturer's option.

C. Plastic Laminate Faced Cabinets: Custom grade.

D. Cabinets:
   1. Cabinet Design Series: As indicated on drawings.
   2. Adjustable Shelf Loading: 50 lbs. per sq. ft.
      a. Deflection: L/144.
   3. Cabinet Style: Flush overlay.
   4. Cabinet Doors and Drawer Fronts: Flush style.
   5. Drawer Construction Technique: Dovetail joints.

2.03 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

B. Hardwood: AHA A135.4; Pressed wood fiber with resin binder, Class 1 - Tempered, 1/4 inch thick, smooth one side (A1S); use for components indicated on drawings.

C. Hardwood Edgebanding: Use solid hardwood edgebanding matching species, color, grain and grade for exposed portions of cabinetry.

2.04 LUMBER

A. Softwood Lumber: NIST PS 20; Graded in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Grade II/Custom; average moisture content of 4-9 percent; species as recommended by manufacturer.

B. Hardwood Lumber for Transparent Finish: NHLA Graded in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Grade II/Custom; Quarter sawn; average moisture content of 4-9 percent; species as follows:
   1. Exposed Surfaces: Species: White Oak.
   2. Semi-Exposed Surfaces: Species: White Oak.
   3. Concealed Surfaces: Species: Poplar.

C. Hardwood Lumber for Opaque or Plastic Laminate Finish:
   1. Semi-Exposed Solid Parts: Close Grained Hardwood, AWI Custom Grade.
   2. Concealed Surfaces: Compatible Species.

2.05 PANEL MATERIALS

A. Hardwood Faced Plywood: HPVA HP-1; graded in accordance with AWI/AWMAC "Architectural Woodwork Quality Standards Illustrated", core of veneer; type of glue recommended for specific application; thickness as required; face veneer as follows:
   1. Concealed Surfaces: Grade B, compatible species, plain sliced, random-matched.
   2. Drawer Bottoms: Grade A, birch, rotary cut, random-matched.

B. Plywood for Curved Panels:
   1. Construct hardwood panels to suit conditions of curved casework.
   2. Fabricate panels with plywood substrate kerfed on backside if required to achieve bending radius.
   3. Complete panel system shall consist of 3/8 inch substrate and applied veneer bending 3/8 inch panels with a balancing hardwood veneer on unexposed face for a total thickness of

3/4 inches. Exposed to view face veneers shall be as specified above. Concealed faces shall be any hardwood veneer suitable for forming a balanced panel.

C. Particleboard: ANSI A208.1; medium density industrial type as specified in AWI/AWMAC "Architectural Woodwork Quality Standards Illustrated," composed of wood chips bonded with interior grade adhesive under heat and pressure; sanded faces; thickness as indicated; use for components indicated on drawings.
   1. Particle Board for Plastic Laminate Finish:
      a. Particle board to be 45 lb. or higher density, and balanced construction with moisture content not to exceed 8%. All particle boards shall meet or exceed the requirements for its type and classification under Commercial Standard CS-236-66, Federal Specification LLL-B-8009A and ASTM D 1037.
      b. Particle Board shall meet the following Performance Requirements. Submit compliance data from the manufacturer prior to fabrication:
         1) Screw Holding, Face: 371 lbs.
         2) Modulus of Rupture: 2,400 psi.
         3) Modulus of Elasticity: 450,000 psi.
         4) Internal Bond: 90 psi.
         5) Surface Hardness: 900 lbs.
   2. Panel Goods for Plastic Laminate Countertops with Sinks:
      a. Plywood constructed with veneer core and hardwood veneers, fabricated with Type I waterproof adhesive, suitable for receiving plastic laminate; or
      b. Particle board with phenolic resin, Type 2-M-2. Phenolic resin shall meet ANSI/AZ08.1 2-M-2, 2-M-3 specifications.

2.06 LAMINATE MATERIALS

A. Manufacturers:

B. The Architect may select finishes from the standard selection of any off the following manufacturers:
   1. Formica Corporation: www.formica.com.
   2. Panolam Industries International, IncNevamar: www.nevamar.com.
   3. Wilsonart: www.wilsonart.com.

C. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

2.07 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Plastic Edge Banding: Extruded PVC, convex shaped; smooth finish; self locking serrated tongue; of width to match component thickness.
   1. Color: As selected by Architect from manufacturer's standard range.
   2. Use at all exposed plywood edges.
   3. Use at all exposed shelf edges.

C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

D. Concealed Joint Fasteners: Threaded steel.

E. Grommets: Standard plastic, painted metal, or rubber grommets for cut-outs, in color to match adjacent surface.

2.08 HARDWARE

A. Adjustable Shelf Supports: Standard side-mounted system using multiple holes for pin supports and coordinated self rests, polished chrome finish, for nominal 1 inch spacing adjustments.
   1. At laminated wood shelving: Haefele 282.24.731 or approved equal.
   2. At glass shelving: Haefele 282.24.730 or approved equal.

B. Adjustable Shelf Supports: Heavy duty back-mounted system using surface mounted metal shelf standards and coordinated cantilevered shelf brackets with cam lock lever, satin chrome finish, for nominal 1 inch spacing adjustments.
   1. Standards Model 87, Brackets Model 187: Knap & Vogt or approved equal.

C. Drawer and Door Pulls: "U" shaped wire pulls, 3-1/2 inch centers, steel with chrome finish.
   1. Model No. 4483: Stanley Hardware or approved equal.

D. Sliding Glass Door Track Assembly: Upper track, shoe, carrier and lower track to be zinc plated steel. Provide steel ball rollers in carriers to be spaced not more than 3 inches on center.
   1. Assembly Model No: Knape & Vogt P992Z ZC or approved equal.

E. Sliding Door Pulls: Circular shape for recessed installation, steel with chrome finish.
   1. Model 836 BR: Knap & Vogt or approved equal.

F. Sliding Glass Door Lock: Adjustable for 1/4 inch glass.
   1. Model No. 965: Knap & Vogt or approved equal.

G. Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with chrome finishsteel with satin finish.
   1. Model No. 210.04.720 cylinder with cam lock body 235.08: Haefele America or approved equal.

H. Catches: Magnetic.

I. Drawer Slide
   1. Static Load Capacity: 100 and 150 pound capacity. See drawer widths below.
   2. Mounting: Side mounted.
   3. Stops: Integral type.
   4. Features: Provide ball bearing slides, self closing/stay closed type.
   5. No. 8700 at drawers up to 24 inches wide and No. 8500 at file drawers and drawers over 24 inches wide: Knap & Vogt or approved equal.

J. Hinges: European style concealed self-closing type, steel with polished finish.
   1. At 3/4 Inch Thick Doors: 170 degree door swing with straight hinge arm at full overlay and half cranked hinge arm at paired applications.
      a. Provide two hinges per door at doors not exceeding 34 inches in height and 24 inches in width.
      b. Provide three hinges per door for doors up to 48 inches in height.
   2. At 1 Inch Thick Doors: 130 degree door swing with angle restriction clip and straight arm hinge.
      a. Provide 3 hinges per door.
   3. At 1-3/8 Inch Thick Doors: 130 degree door swing with angle restriction clip, half cranked hinge and mounting plates as required for door spacing as specified above.
      a. Provide 4 hinges per door. Where pivot hinges are indicated provide top and bottom pivots equal to Stanley 327, or approved equal.
   4. Model No. 170 Series with 80.6107.21 cover cap: Julius Blum or approved equal.

K. Overhead Door Stops: Lid stay with nickel bronze or stainless steel finish.
   1. Model No. S-214N , 8 or 10 inch size as required: Selby Hardware or approved equal.

L. Countertop Support Brackets:
   1. 1-1/2 x 1-1/2 inch steel tubing "L" bracket with plastic end caps.
      a. 20 to 25 Inch Deep Counters: Knee Saver Support by Iron Shore Inc., or approved equal.
      b. 25 to 30 Inch Deep Counters: Knee Saver Extended Support by Iron Shore Inc., or approved equal.

2.09 FABRICATION

A. Cabinet Style: Flush overlay.

B. Cabinet Doors and Door Fronts: Flush style.

C. Plastic Laminate Casework:
   1. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
   2. All surfaces, exterior and interior, of cabinets and cases exposed to view shall be veneered with laminated plastic finish sheet. Exposed to view applies equally to tops and bottoms of cases, cabinet shelving and interior of cabinets and cases exposed when doors are open.
   3. Apply plastic laminate to core edges prior to application of laminate to faces. Individually cut edges and face laminate material and apply in their final or near final sizes. All edges shall be eased.
   4. Apply Thermoset Decorative Overlay (Melamine Panel) at cabinet interiors and where indicated on the drawings. Black or white, color as selected by the Architect.
   5. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.
   6. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
      a. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
      b. Cap exposed plastic laminate finish edges with material of same finish and pattern.
      c. Orient grain or laminate pattern consistently on doors, drawer fronts and panels.
   7. Matching Wood Grain: Comply with requirements of quality standard for specified Grade exclusively.

D. Drawers:
   1. Connections between backs, sides and front of drawer body shall be regular multiple drawer dovetails with glued joints.
   2. Connection between drawer front and drawer body shall be with not less than 4 countersunk wood screws.
   3. Drawer body shall be 1/2 inch thick hardwood. Drawer bottoms shall be 1/4 inch plywood.
   4. Drawer Fronts:
      a. Plastic Laminate Casework: Drawer front to be 3/4 inch thick particle board core with plastic laminate applied to all surfaces.
   5. Drawers shall slide on metal drawer slides as indicated above.

E. Doors:
   1. Plastic laminate doors shall have veneers applied to all surfaces.
      a. All cabinet doors shall have a 3/4 inch thick particle board core, minimum.
      b. Doors over 48 inches high or 24 inches wide shall have a 1 inch thick particle board core, minimum.
      c. Doors over 60 inches high shall have a 1-3/8 inch thick, solid particle board core, constructed in accordance with type PC-HPDL, Section 1300, Architectural Flush Doors, of AWI Quality Standards.
   2. Provide overhead door stops wherever cabinet doors will hit adjacent walls.

F. Cabinet Tops, Bottoms, Ends and Backs: Shall be of 3/4 inch thick core minimum, except open face cabinets shall have tops and bottoms of minimum 1 inch thick core.

G. Shelves:
   1. In Cabinets with Doors: At cabinets up to 30 inches wide, provide 3/4 inch thick minimum cores. At cabinets over 30 inches wide, provide 1 inch thick cores.
   2. In Open Cabinets and Wall Mounted Shelves: Provide 1 inch thick cores.
   3. All removable or adjustable shelves shall be finished on all sides.

H. Acrylic Plastic (Plexiglas) Shelves/Dividers:

1. Provide a slot routed into the casework frame to receive shelves/dividers. Slot shall be a minimum 1/4 inch deep.
2. Polish all edges of shelves/ dividers.

I. Recessed Toe Space: Toe space and all exposed to view surfaces shall be faced with plastic laminate matching adjacent color.

J. Countertops and Back Splash:
1. Back splash shall be constructed with 3/4 inch panel material. Countertops shall be constructed with 1 inch thick core minimum. Provide plastic laminate on top surface of countertop and all exposed surfaces of backsplash. Thickness of exposed edges of countertops shall be 1-1/2 inches unless indicated otherwise on the drawings.
2. Plastic laminate countertops shall receive a backing sheet on the underside of countertop.
3. Where sinks occur in countertops, apply sealant at joint between backsplash and countertop. Sealants shall be silicone, clear.
4. Height of back splash shall be as indicated on drawings; provide 4 inch high back splash where not indicated. Provide end splashes wherever countertops abut end walls unless indicated otherwise.
5. Provide cutouts for plumbing fixtures, outlet boxes, and fixtures and fittings. Coordinate with plumbing, mechanical and electrical drawings and verify locations of cutouts from on-site dimensions. Seal edges of cutouts for sinks and other wet equipment.

K. Sliding Glazed Doors: Glass shall be 1/4 inch tempered clear glass with a two-piece, screw type, chrome finger pull in each door. Polish all exposed edges. Shop glaze glass materials using the Interior Dry method specified in Section 08 8000 where applicable.

L. Provide access panels in casework where indicated, or where required to access equipment or utilities. Use propeller nuts with oval head screws and cup washers.

M. Install overhead door stops wherever cabinet doors or door pulls will engage or hit abutting wall surfaces.

N. Provide a grommet in countertops adjacent to each electrical outlet mounted under the countertop; both power and communication outlets and where located on the plans. Indicate locations on shop drawings and coordinate final placement of grommets on site with Architect.

O. Scribes: Provide scribe between cabinet body and side walls. Cut scribe to fit tight against wall and leave a maximum of 1/2 inch gap between side wall and cabinet doors and/or drawers.

P. Edging: Fit shelves, doors and exposed edges with plastic laminate edging unless indicated otherwise on the drawings. Do not use more than one piece for any single length

2.10 SHOP FINISHING

A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
1. Transparent:
a. Sheen: Gloss.
b. Products:
1) Sherwin-Williams Ultra-Cure Waterborne UV Topcoat, Clear, AWI Finishing System 10.
2) Substitutions: Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 FIELD MEASUREMENTS

A. Take necessary measurements in the field to assure proper dimensions for the work of this Section.

3.03 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

C. Use fixture attachments in concealed locations for wall mounted components.

D. Use concealed joint fasteners to align and secure adjoining cabinet units and countertops.

E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

F. Secure cabinets to floor using appropriate angles and anchorages.

G. Secure casework to walls using appropriately sized teck screws for attachment to horizontal furring or metal studs.

H. Mount countertop support brackets at stud locations only; set anchors in studs.

I. Seal joints between casework and adjacent construction. Color of sealant to match adjacent construction.

3.04 ADJUSTING

A. Test installed work for rigidity and ability to support loads.

B. Adjust moving or operating parts to function smoothly and correctly.

3.05 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 07 13 26

SELF-ADHERING SHEET WATERPROOFING SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Procedures included in GCP Applied Technologies Waterproofing Systems Contractor's Handbook (latest edition) shall be included and apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   a. Modified bituminous sheet waterproofing.
   b. Adhesive-coated HDPE sheet waterproofing and preformed waterproofing installation components.
   c. Liquid applied waterproofing.
   d. Water-stop systems.
   e. Molded-sheet drainage panels.
   f. Insulation.

B. Related Sections include the following:
   g. Section 01 3000 – Administrative Requirements: Submittal Procedures.
   h. Section 03 3000 – Cast-In-Place Concrete.
   i. Section 07 6200 – Sheet Metal Flashing and Trim.
   j. Section 07 9200 – Joint Sealants.

1.03 SUBMITTALS

A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.

B. Shop Drawings: Show locations and extent of waterproofing and watertight envelope. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.
   k. Shop Drawings and Installation Details shall reflect the built condition of the job to indicate all modifications/alterations to original design documents.
   l. Include all special conditions where waterproofing system interfaces with other materials & systems. Include all special conditions where waterproofing is integrated with specialty Hitachi equipment footings and supports.

C. Samples: For the following products:
   a. 12-by-12-inch (300-by-300-mm) square of waterproofing and flashing sheet.
   b. 12-by-12-inch (300-by-300-mm) square of insulation.
   c. 4-by-4-inch (100-by-100-mm) square of drainage panel.

D. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.

E. Qualification Data: For Installer and manufacturer.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for waterproofing.

G. Warranties: Special warranties specified in this Section.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum of 20-years experience in the production of sheet membrane waterproofing.

B. Installer Qualifications: A firm that is approved waterproofing manufacturer for installation of waterproofing required for this Project.

C. Source Limitations: Obtain primary waterproofing materials and through one source from a single manufacturer.

D. Mockups: Before beginning installation, install waterproofing to 100 sq. ft. (9.3 sq. m) foundation wall to demonstrate surface preparation, crack and joint treatment, corner treatment, and execution quality
   a. If Architect & Owner determine mockups do not comply with requirements, reapply waterproofing until mockups are approved.
   b. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Preinstallation Conference: Conduct conference at Project site.
   c. Contractor shall review with Architect & Owner waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs. Contractor shall delineate procedures addressing stopping points in construction, protection from weather, and other construction sequencing issues which will affect work described in this section.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver liquid materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer.

C. Remove and replace liquid materials that cannot be applied within their stated shelf life.

D. Store rolls according to manufacturer's written instructions.

E. Protect stored materials from direct sunlight.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.
   d. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.07 WARRANTY

A. Special Manufacturer's System Watertightness Warranty: Manufacturer's standard form in which manufacturer agrees to replace waterproofing material that does not comply with requirements or that fails to remain watertight within 20 year warranty period. During the warranty period, restore defective Work to the standard of the Contract Documents, including materials, labor, refinishing and other costs incidental to the Work. Within 24 hours after receipt of notice from the Owner, inspect the Work and immediately repair leaks in the Work. Restore Work found to be defective as defined in the Contract Documents within 10 days after receipt of notice from the Owner.

1.08 REFERENCE STANDARDS

A. ASTM C 836 – Standard Specification for High Solids, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course, 2006.

B. ASTM D412 – Standard Test Methods for Vulcanized Rubber and Thermoplastic elastomers-tension; 2006a.

C. ASTM D570 – Standard Test Method for Water Absorption of Plastics; 1998 (Reapproved 2010).

D. ASTM 882 – Standard Test Method for Tensile Properties of Thin Plastic Sheathing; 2009.

E. ASTM D 903 – Standard Test Method for Peel or Stripping Strength of Adhesive Bonds; 2004.

F. ASTM D 1434 – Standard Test Method for Determining Gas Permeability Characteristics of Plastic Film Sheeting; 2009.

G. ASTM D 1876 – Standard Test Method of Peel Release of Adhesives (T-Peel); 2008.

H. ASTM D 1970 – Standard Specification for Self-Adhering Polymer Modified bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2009.

I. ASTM D 3767 – Standard Practice for Rubber – Measurements of Dimensions; 2008.

J. ASTM D 5385 – Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes; 2006.

K. ASTM E 96 – Standard Test Methods for Water Vapor Transmission of Materials; 2010.

L. ASTM E154 – Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover, 2008a.

PART 2 - PRODUCTS

2.01 HORIZONTAL SHEET WATERPROOFING ASSEMBLIES AT BUILDING FOUNDATIONS (WATERPROOFING SYSTEM #1) At conditions where waterproofing assembly system occurs between concrete slabs, mud slabs, foundations or foundation mats, GCP Preprufe 300R shall be used (and accompanying system components including but not limited to preformed corner conditions). Where horizontal waterproofing condition intersects a vertical wall or foundation, GCP Preprufe Tape and Bituthene shall provide the transition condition to the Bituthene Liquid Membrane (Bituthene Liquid Membrane is installed continuously across footing prior to vertical foundation wall construction and integrated with Vertical Sheet Waterproofing System. Where reinforcing steel prevents Bituthene Liquid Membrane application, Bituthene Deck Prep shall be used and shall achieve a 90 mil thickness).

2.02 VERTICAL SHEET WATERPROOFING ASSEMBLIES AT BUILDING WALLS AND FOUNDATIONS (WATERPROOFING SYSTEM #2) At conditions where waterproofing assembly system occurs on foundation walls, GCP Bituthene 3000 shall be used (and accompanying system components). Vertical Sheet Waterproofing at exterior walls shall be a continuous assembly from the bottom of the back up steel stud track or other architectural wall system, through the exterior panel system, down foundation wall below grade to structural footing and providing waterproofing protection to foundation drain level. Waterproofing System to include (in addition to the Bituthene 3000 membrane) the applicable Bituthene Primer to foundation walls, Bituthene Liquid Membrane fillet at inside corner conditions, Bituthene Liquid Membrane termination where waterproofing membrane terminates, Bituthene 3000 reinforcement at locations where membrane bends, Hydroduct 220 combination drainage and protection layer (integrated with foundation drain system components) the entire length of waterproofing terminating into Hydroduct Coil 600.

2.03 VERTICAL SHEET WATERPROOFING ASSEMBLIES AT BLIND SIDE (INACCESSIBLE) CONDITIONS (WATERPROOFING ASSEMBLY #3) At conditions where waterproofing assembly is installed on permanent formwork (left in place after concrete pour) used to hold existing soils in place or filling voids in adjacent construction, GCP Preprufe 160R Membrane System shall be used (and accompanying system components). Waterproofing system to include Preprufe Joint Tape (as condition warrants) and Bituthene Liquid Membrane for sealing penetrations. Preprufe Tieback Cover System shall be incorporated where conditions warrant. Tieback Cover shall completely cover formwork connections (which would protrude into the waterproofing assembly). Where possible and feasible Preprufe Preformed Corners shall be incorporated into the waterproofing assembly system.

2.04 MOLDED-SHEET DRAINAGE PANELS

A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel for Vertical Applications: Manufactured composite subsurface drainage panels consisting of a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 (0.21-mm) sieve laminated to one side with a polymeric film bonded to the other side of a studded, nonbiodegradable, molded-plastic-sheet drainage core, with a vertical flow rate of 16 gpm per ft. (200 L/min. per m).
   a. Basis-of-Design Product: GCP Applied Technologies; Hydroduct 220.

B. Non-Woven-Geotextile-Faced, Molded-Sheet Drainage Panel for Horizontal Applications: Manufactured composite subsurface drainage panels consisting of a non-woven-geotextile facing with an apparent opening size not exceeding No. 100 (0.147-mm) sieve laminated to one side with a polymeric film bonded to the other side of a studded, nonbiodegradable, molded-plastic-sheet drainage core, with a horizontal flow rate not less than 2.8 gpm per ft. (35 L/min. per m).
   a. Basis-of-Design Product: GCP Applied Technologies; Hydroduct 660.

C. Perimeter Drain: Combination low- and high-profile drainage core, geotextile and polymeric film with universal outlet, tee and connector fittings to transport water to drainage exits as recommended by manufacturer of molded sheet drainage panels.
   a. Basis-of-Design Product: GCP Applied Technologies; Hydroduct Coil 600 Perimeter Drain.

2.05 WATER STOP SYSTEMS

A. At locations where Waterproofing System #1 is installed and is interrupted by a vertical concrete wall (both at the exterior perimeter walls as well as all interior walls) GCP Adcor ES (1”x1/2”) shall be installed continuously at joint between vertical wall and slab that is placed on top of Waterproofing System #1.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.
   a. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.
   b. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
   c. Verify that compacted subgrade or concrete mud-slab is dry, smooth, and sound; and ready to receive adhesive-coated HDPE sheet.
   d. Verify that concrete substrates are smooth, float finished and monolithic.
   e. Verify that vertical soil retention systems are prepared using drainage composite, plywood, shotcrete or other approved means to achieve a uniform, sound and continuous substrate ready to receive the adhesive-coated HDPE Sheet.
   f. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 SURFACE PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.
   a. Install sheet strips and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch (1.6 mm).

F. Bridge and cover isolation joints, expansion joints and discontinuous deck-to-wall and deck-to-deck joints with overlapping sheet strips.
   a. Invert and loosely lay first 9 inch (225 mm) sheet strip over center of prepared and sealed joint. Firmly adhere second 18 inch (450mm) sheet strip to first and overlap to substrate.

G. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.
   a. Install 12 inch membrane strips centered over vertical inside corners. Install 3/4-inch (19-mm) fillets of liquid membrane on horizontal inside corners and as follows:
      (1) At footing-to-wall intersections, extend liquid membrane 6 inches (152 mm) in each direction from corner or install 12 inch (305 mm) membrane strip centered over corner.
      (2) At plaza deck-to-wall intersections, extend liquid membrane or sheet strips 6 Inches (152 mm) onto deck waterproofing and to finished height of sheet flashing.

H. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

3.03 MODIFIED BITUMINOUS SHEET WATERPROOFING APPLICATION

A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and according to recommendations in ASTM D 6135.

B. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.
C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch- (64-mm-) minimum lap widths and end laps. Overlap and seal seams and stagger end laps to ensure watertight installation.
   a. When ambient and substrate temperatures range between 25 and 40 deg F (minus 4 and plus 5 deg C), install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F (16 deg C).

D. Two-Ply Application: Install sheets to form a membrane with lap widths not less than 50 percent of sheet widths to provide a minimum of 2 thicknesses of sheet membrane over areas to receive waterproofing.

E. Horizontal Application: Apply sheets from low point to high point of decks to ensure that side laps shed water.

F. Apply continuous sheets over sheet strips bridging substrate cracks, construction, and contraction joints.

G. Seal exposed edges of sheets at terminations not concealed by metal counterflashings or ending in reglets with mastic.

H. Install sheet waterproofing and auxiliary materials to tie into adjacent waterproofing.

I. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches (150 mm) beyond repaired areas in all directions.

J. Install protection course with butted joints over waterproofing membrane immediately.
   a. Molded-sheet drainage panels and Insulation drainage panels to be approved by waterproofing manufacturer and installed immediately.

K. Remove sheet waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

3.04 ADHESIVE-COATED HDPE SHEET WATERPROOFING APPLICATION

A. Install adhesive-coated HDPE sheets according to manufacturer's written instructions.

B. Place and secure molded-sheet drainage panels over substrate. Lap edges and ends of geotextile to maintain continuity.

C. Vertical Applications: Install adhesive-coated HDPE sheet with HDPE face against substrate. Accurately align sheets and maintain uniform 3-inch- (75-mm-) minimum lap widths and end laps. Overlap and seal seams and stagger and tape end laps and T-joints to ensure watertight installation. Roll seams and end laps firmly. Mechanically fasten to substrate at 2 feet (0.6 m) intervals centered in the self-adhesive selvedge prior to making the side lap. If the membrane is installed in vertical lifts and will tie into subsequent sheets of membrane, install the upper sheet behind the lower to insure that laps shed water before taping and rolling the end laps.
    a. Securely fasten final top termination of membrane with continuous metal termination bar anchored into substrate and cover with detailing tape.

D. Horizontal Applications: Install adhesive-coated HDPE sheet with HDPE face against substrate. Accurately align sheets and maintain uniform 3-inch- (75-mm-) minimum lap widths and end laps. Overlap and seal seams. Overlap, stagger, and seal end laps and T-joints with detail tape to ensure watertight installation. Roll seams and endlaps firmly with a heavy metal seam roller.

E. When ambient and substrate temperatures range between 25 and 55 deg F (-4 and 13 deg C), install detail tape designed for low-temperature application at all laps and detailing. Apply detail tape to clean dry surfaces. During cold or damp conditions, warm the membrane selvedge and detail tape using a hot air gun to remove moisture and improve initial adhesion.

F. Corners: Seal lapped terminations and cut edges of sheet waterproofing at inside and outside corners with detail tape.

G. Seal penetrations through sheet waterproofing to provide watertight seal with prefabricated plastic covers, or detail tape patches or wraps and a liquid-membrane troweling as recommended by membrane manufacturer.

H. Construction Joints: Apply 8-inch (200 mm) joint tape to the surface of the membrane and centered along the line of all horizontal and vertical concrete pour joints.

I. Install sheet waterproofing and auxiliary materials to produce a continuous watertight tie into adjacent waterproofing.

J. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Tape perimeter of damaged or nonconforming area extending 6 inches (150 mm) beyond repaired areas in all directions. Apply a patch of sheet waterproofing and firmly secure with detail tape.

K. Remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

3.05 MOLDED-SHEET DRAINAGE PANEL INSTALLATION

A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Use adhesives, tapes, or

mechanical fasteners that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

.

3.06 FIELD QUALITY CONTROL

A. Owner may engage an independent site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions; surface preparation; membrane application, flashings, protection, and drainage components; and to furnish daily reports to Architect. Contractor will accommodate scheduling in advance to allow for owner's representative inspections.

3.07 PROTECTION AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Protect installed board insulation and insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 07 14 16
COLD FLUID-APPLIED WATERPROOFING

TWO-COMPONENT WATERPROOFING SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Application of two-component, cold fluid-applied waterproofing membrane.

1.02 RELATED SECTIONS

A. Section 03 30 00 – Cast-in-Place Concrete.

B. Section 04 20 00 – Unit Masonry.

C. Section 07 13 26 – Self-Adhering Sheet Waterproofing.

D. Section 07 21 00 – Thermal Insulation.

E. Section 07 60 00 – Flashing and Sheet Metal.

F. Section 07 92 00 – Joint Sealants.

G. Section 33 46 13 - Foundation Drainage.

1.03 REFERENCES

A. ACI 301.2R - Identification and Control of Visible Effects of Consolidation on Formed Concrete Surfaces.

B. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers -Tension.

C. ASTM E96 (Method B) - Standard Test Methods for Water Vapor Transmission of Materials.

D. ASTM D1970-01 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

1.04 SUBMITTALS

A. Comply with Section 01 33 00 - Submittal Procedures.

B. Submit manufacturer's product data and application instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Store materials in a clean, dry area in accordance with manufacturer's instructions.

C. Store at temperatures between 40 degrees F (4 degrees C) and 90 degrees F (32 degrees C). Keep materials at or near room temperature during cooler weather application.

D. Protect materials during handling and application to prevent damage or contamination.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Product not intended for uses subject to abuse or permanent exposure to the elements.

B. Do not apply membrane when air, material, or surface temperatures are expected to fall below 20 degrees F (-7 degree C) within four hours of completed application.

C. Do not apply membrane if rainfall is forecast or imminent within 12 hours.

D. Do not apply to frozen, frost, ice or dew-covered concrete.

E. Membrane can be applied to green concrete.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. W. R. MEADOWS®, INC., PO Box 338, Hampshire, Illinois 60140-0338. (800) 342-5976. (847) 683-4500. Fax (847) 683-4544. Web Site www.wrmeadows.com.

2.02 MATERIALS

A. Waterproofing Membrane: Two-component, polymer-modified, cold fluid-applied waterproofing membrane with curative catalyzer.
   1. Performance Based Specification: Waterproofing membrane shall have the following properties as determined by laboratory testing:
      a. Color: Black.
      b. Solids: 65%.
      c. Pull Adhesion, ASTM D4541: 75 psi to Portland concrete; 100 psi unit masonry.
      d. Peel Adhesion Strength, ASTM D903: 13 lbf./in to Portland concrete; 12 lbf./in. unit masonry.
      e. Elongation, ASTM D412: 800%.
      f. Tensile Strength, ASTM D412: 40 psi.
      g. Nail Sealability, ASTM D1970: No leakage.
      h. Water Vapor Permeance, ASTM E96 (Method A): 0.134 perms.
      i. Firm Set: <minutes at 75 degrees F and 50% RH.; Dry Film: 75 degrees F and 50% RH.
   2. Basis-of-Design Waterproofing:
      a. MEADOW-PRUF CO-SPRAY Waterproofing System by W. R. MEADOWS.

2.03 ACCESSORIES

A. Curative Catalyzer: CURE-IT by W. R. Meadows.

B. Concrete Repair Materials: MEADOW-PATCH™ 5 and 20 Concrete Repair Mortars.

C. Waterstop: WATERSTOP EC by W. R. Meadows.

D. Self-Adhering Detail Membrane: DETAIL STRIP.

E. Waterproofing Protection Course: PERMINATOR™ 10 mil or PERMINATOR 15 mil.

F. Rolled Matrix Drainage System: “B” Series MEL-DRAIN™.

G. Rolled or Rigid Sheet Protection Course Materials: PC2R or PC-2 PROTECTION COURSE.

H. Termination Sealant and Adhesive: BEM.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive membrane. Notify architect if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected.

3.02 SURFACE PREPARATION

A. Protect adjacent surfaces not designated to receive waterproofing.

B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions. Strike all unit masonry surface flush.

C. Do not apply waterproofing to surfaces unacceptable to manufacturer.

D. Clean concrete surfaces so they are free of all coatings, dirt, oil, paints and any other contaminants such as form release agents.

E. Concrete surfaces must be clean, smooth and free of standing water.

F. Patch all holes and voids and smooth out any surface misalignments.

G. Remove and patch all concrete form ties.

H. Pretreat all shrinkage cracks less than 1/16 inch (1.6 mm) with a 60-mil coating of primary two-component cold fluid-applied waterproofing membrane.

I. Pretreat all non-moving cracks and joints between 1/16 inch (1.6 mm) and 1/8 inch (3.2 mm) with termination sealant and allow to cure.
   1. Apply a 9-inch (23 cm)-wide self-adhering detail membrane over primed substrate, centered over the joint.
   2. Roll press to ensure full engagement with the substrate.

J. Rout and fill static cracks between 1/8 inch (3.2 mm) and ¼ inch (6.35 mm) with restoration mortar.

1. Apply self-adhering detail membrane to repaired and cured joint.
2. Roll press detail membrane to ensure full engagement with substrate.

K. Inside and Outside Corner Reinforcement
1. Apply a 9-inch (23 cm)-wide self-adhering detail membrane, centered over corners with 4-1/2 inches (11.5 cm) of membrane onto each adjacent surface. Ensure a 2-inch (5 cm) lap on successive courses.

L. Pipe Penetrations
1. Cut half of the 9-1/2-inch (24 cm)-wide portion of self-adhering detail membrane into “fingers”.
2. Over primed substrates, center self-adhering detail membrane over the inside corner of pipe and surrounding substrate.
3. Roll-press self-adhering detail membrane. When not covered with primary two-component cold fluid-applied membrane at the end of the day’s work, seal all edges of self-adhering detail membrane with termination sealant.

3.03 PRIMARY MEMBRANE APPLICATION

A. Apply two-component, cold fluid-applied waterproofing membrane system in accordance with manufacturer's instructions current technical data sheet and this guide specification.

B. Thoroughly mechanically mix membrane prior to application.

C. Uniformly apply membrane through appropriate co-spray equipment at a minimum coverage rate of 25 square feet per gallon (0.49 square meters per liter) providing a thickness of 65 wet mils.

D. Ensure complete integration of two-component cold fluid-applied membrane into all minor pockets, voids, pock marks and indentations.

E. Frequently inspect surface area during application with a wet mil gauge to ensure consistent thickness.

F. Ensure a cured film thickness of 45 mils dry.

G. Avoid use of materials containing coal tar, solvents, polysulfide polymers, polyurethane, PVC or silicone in connection with primary two-component cold fluid-applied waterproofing membrane.

H. Upon curing of the waterproofing system, spot-adhere [drainage panel] or [rolled modified asphalt protection sheet] or [mineral-fortified asphaltic sheet] or [polyolefin sheet] course with primary two-component cold fluid-applied waterproofing or manufacturers termination sealant and adhesive.

I.

3.04 PROTECTION

A. Backfill and cover the membrane immediately upon completion. Exercise care with backfilling operations to prevent damaging waterproofing membrane system.

B. Protect completed waterproofing system from potential damage from the trades and extended UV exposure using appropriate measures.

END OF SECTION

SECTION 07 21 00

THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Rigid Board Insulation.

B. Batt insulation.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

B. Section 01 6000 - Product Requirements: Substitution procedures.

C. Section 07 2600 - Weather Barriers: Separate air barrier and vapor retarder materials.

D. Section 07 5423 - Thermoplastic Membrane Roofing: Insulation specified as part of roofing system.

E. Section 07 8400 - Firestopping: Insulation as part of fire-rated through-penetration assemblies.

F. Section 09 2116 - Gypsum Board Assemblies: Acoustic insulation inside walls and partitions.

1.03 REFERENCE STANDARDS

A. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2010.

B. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2006.

C. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2010.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2010b.

E. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2010.

F. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C; 2011.

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.02 FOAM BOARD INSULATION MATERIALS

B. Polyisocyanurate Board Insulation: Rigid cellular foam, complying with ASTM C1289; Type II, Class 1, cellulose felt or glass fiber mat both faces; Grade 2.
   1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   2. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.
   3. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   4. Compressive Strength: 20 psi
   5. Board Size: 48 x 96 inch.
   6. Board Thickness: As indicated on Drawings.
   7. Board Edges: Square.

C. Exposed Polyisocyanurate Board Insulation: Rigid cellular foam, complying with ASTM C1289; Type I, aluminum foil both faces; Class 2, glass fiber-reinforced core.
   1. Flame Spread Index: 25, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   3. Compressive Strength: 25 psi
   4. Board Size: 48 x 96 inch.
   5. Board Thickness: 5/8 inch.
   6. Edge: Square edge/shiplap.
   7. Basis of Design: Dow Tuff-R.

2.03 BATT INSULATION MATERIALS

B. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
   1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 50 or less, when tested in accordance with ASTM E84.
   3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
   4. Formaldehyde Content: Zero.
   5. Thickness: As indicated on the Drawings.
   6. Facing: None.

2.04 ACCESSORIES

A. Clips: Aluminum clips as required to secure insulation to mullions.

B. Pins: Aluminum pins with clinch shields as required for attachment of insulation. Pins shall be located, sized and installed according to the curtain wall system manufacturer's guidelines or be a minimum 4-1/2 inch long, 13 ga pin attached to a nominal 2 x 2 inch plate, spaced a minimum 12 inches on center.

C. Support Channels: Aluminum or primed and finished steel channels to span between mullions to support insulation

E. Tape: Bright aluminum self-adhering type, mesh reinforced, 2 inch wide.

F. Transition Tape: Equal to Grace Construction Products, "Vycor 40 Tape."

H. Insulation Fasteners: Impaling clip of galvanized steel with washer retainer and clips, to be adhered or mechanically fastened to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

I. Wire Mesh: Galvanized steel, hexagonal wire mesh.

J. Adhesive: Type recommended by insulation manufacturer for application.

K. Finish: Accessory surfaces exposed to exterior shall be of same black color as insulation face, flat black where applicable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation and adhesive.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

C. Provide written report listing conditions detrimental to performance of work in this section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.07 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 21 19
FOAMED-IN-PLACE INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Foamed-in-place insulation.

1.02 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

C. ASTM D 1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastics.

D. ASTM D 6226 - Standard Test Method for Open Cell Content of Rigid Cellular Plastics.

E. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

F. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

G. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, insulation properties, overcoat properties, surface burning characteristics and preparation requirements.

C. Certificates: Certify that products of this section meet or exceed specified requirements.

D. Manufacturer's Installation Instructions: Indicate special procedures, processes, and perimeter conditions requiring special attention.

E. Certificates: Certify that products of this section meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing work of the type specified, with minimum three years documented experience.

1.05 REGULATORY REQUIREMENTS

A. Conform to applicable code for flame and smoke limitations.

1.06 FIELD CONDITIONS

A. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to site in manufacturer's original, unopened containers and packaging with labels clearly indicating manufacturer and material

B. Store materials in an area protected from freezing and overheating damage and in accordance with manufacturer's instructions.

C. Protect materials during handling and application to prevent damage and contamination,

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Foamed-In-Place Insulation:
   1. Basis of Design
      a. SES Foam LLC
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. SES Sucraseal™ 0.5 lb spray polyurethane foam insulation
B. Nominal core density: 0.5 lbs/ft^3, ASTM D 1622
C. Open cell content: > 90%, ASTM D 6226
D. Moisture vapor transmission: Report value, ASTM E 96
E. Surface Burning Characteristics: Maximum flame spread/smoke developed rating of 5/450,ASTM E 84
F. R-value: Average R-value of 3.7 per inch, ASTM C 518 at 75°F mean temperature.
G. Air leakage:< 0.02 L/s-m^2, ASTM E 283
H. Rapidly renewable content: ::z: 17% in cured foam, ASTM D 6866
I. Fungi Resistance: Zero rating, ASTM G 21
J. Dimensional Stability (200°F dry):< 5% volume change, ASTM D 2126
K. Dimensional Stability (-40°F): < 5% volume change, ASTM D 2126
L. Dimensional Stability (158F & 100% RH):< 5% volume change, ASTM D 2126
M. Resistance to Ignition: Pass without intumescent coating, ICC ES AC 377, Appendix X
N. Standard Heat Potential of Building Materials: BTU/lb, NFPA 259
0. Standard of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components: Compliance, NFPA 285
P. Fire resistance rating: Pass walls (U305) and ceilings (P522), UL263/ASTM E119
Q. Volatile Organic Compounds: Pass Office, Single family residence & Classroom Requirements,California Section 01350

2.03 ACCESSORIES

A. Sealant Foam: CF 124 Filler Foam by Hilti or equivalent.
B. Joint Sealer: Single component polyurethane type; Sikaflex la by Sika Corp. or equivalent.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify work within construction spaces or crevices is complete prior to insulation application.
B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation or overcoat adhesion.
C. Verify that other work on and within spaces to be insulated is complete prior to application.
D. Notify Architect of conditions that would adversely affect the application.

3.02 PREPARATION

A. Comply with manufacturer's written installation instructions for preparing surfaces and cavities indicated to receive insulation.
B. Mask and protect adjacent surfaces from over spray or dusting.
C. Remove foreign materials, dirt, grease, oil, paint, laitance, efflorescence and other substances that will affect application.

D. Apply primer in accordance with manufacturer's instructions.

3.03 APPLICATION

A. Apply insulation in accordance with manufacturer's instructions.

B. Apply insulation by spray method, to a uniform monolithic density without voids.

C. Apply to achieve a thermal resistance as shown on the drawings.

D. Apply overcoat monolithically, without voids to fully cover foam insulation that is exposed in areas where foam is exposed without a thermal or ignition barrier.

E. Apply insulation to fill voids around accessible service and equipment penetrations.

F. Patch damaged areas.

G. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts.

H. Trim excess away for applied trim or remove as required for continuous sealant bead.

3.04 SUBSTRATE PREPARATION CONSIDERATIONS

A. WOOD:

1. Plywood shall contain no more than 18% water, as measured in accordance with ASTM D-4449and 4444-84.

2. Most untreated and unpainted wood surfaces need not be primed. The spray polyurethane foam can be applied directly to the dry wood. Priming may be required in certain instances. See the spray polyurethane foam manufacturer for specific details.

B. STEEL:

1. Primed: If the primed metal surface is free of loose scale, rust, weathered or chalking paint. It can be cleaned using vacuum equipment and hand or power tools to remove loose dirt. Grease, oil, or other contaminants shall be removed with proper cleaning solutions.

2. Previously Painted: Clean the painted metal surface using hand or power tools to remove loose scale and dirt. Grease, oil, and other surface contaminants can be cleaned using a power wash technique.

3. Galvanized: When required, clean galvanized steel as recommended by the primer manufacturer.

4. Unpainted Steel: Clean as recommended by primer manufacturer in order to prepare the steel surface for the primer.

C. CONCRETE AND MASONRY: Must be cured, and loose dirt and any other contaminants removed.

D. SHEATHING BOARD: Most sheathing boards need not be primed prior to the application of sprayed-in-place polyurethane foam.

3.05 PRIMERS

When required, the primer shall be applied to the properly prepared substrate in accordance with the manufacturer's guidelines so as to achieve a minimum thickness of dry mils. Many primers require a curingtime of 24 hours prior to application of spray polyurethane foam or other products.

3.06 VAPOR RETARDERS

A. When required, a vapor retarder shall be applied to the substrate to be insulated or to the

finished spray polyurethane foam insulation. The predominant direction of the vapor drive determines the location of the vapor retarder relative to the spray polyurethane foam.

B. The vapor retarder shall be applied in accordance with manufacturer's specifications so as to achieve the desired perm rating per ASTM E-96, Method E.

3.07 THERMAL BARRIERS

A. The spray polyurethane foam must be separated from the interior (occupied) space by a 15- minute rated thermal barrier. The thermal barrier must be applied in accordance with manufacturer guidelines.

B. Exception to the thermal barrier requirement is allowed when testing in compliance with interior finish (NFPA 286) is demonstrated.

C. Exception to the thermal barrier requirement is allowed in attics/crawlspaces where entrance is allowed only for the services of utilities and the spray polyurethane foam insulation is covered by a prescribed barrier to ignition. Ignition barriers are prescribed in IRC and IBC R314 and Chapter 26, respectively.

3.08 IGNITION BARRIERS

A. The prescribed ignition barrier in attics and crawlspaces may be omitted when the spray foam has conducted end use configuration testing and analysis per IBC Section 2603.96 and IRC Section R316.6, to qualify without a prescriptive ignition barrier or intumescent coating in unvented attics conforming with IBC Section 1202.37 or IRC Section R806.5. Restrictions in this application apply, consult local building codes.

3.09 FIELD QUALITY CONTROL

A. Field inspections and tests will be performed by an independent testing agency under provisions of Section 01 4000 - Quality Requirements.

3.10 PROTECTION

A. Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION

SECTION 07 25 00

AIR BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air Barriers: Materials that form a system to stop passage of air/moisture while maintaining moisture-vapor permeability through exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls.

B. Liquid Applied flashing membrane for use on walls with sheathing without integral weather barrier .

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

B. Section 01 6000 - Product Requirements: Substitution procedures.

C. Section 07 9005 - Joint Sealers: Sealant materials and installation techniques.

1.03 DEFINITIONS

A. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.

1.04 REFERENCE STANDARDS

A. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014a.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

C. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

D. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on material characteristics, performance criteria, and limitations.

C. Shop Drawings: Provide drawings of special joint conditions.

D. Samples: Two 12 x 12 inch samples of membrane and two 12 inch long samples of each tape.

E. Test Results: Submit copies of test results showing performance characteristics equaling or exceeding those specified.

F. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

1.06 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

PART 2 PRODUCTS

2.01 WEATHER BARRIER ASSEMBLIES

A. Air Barrier:
   1. On outside surface of sheathing of exterior walls use air barrier coating.

2.02 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)

A. Air Barrier, Fluid Applied: Vapor permeable, elastomeric waterproofing.

B. Air Barrier Coating:

1. Air Permeance: 0.001 cubic feet per minute per square foot, maximum, when tested in accordance with ASTM E2178.
2. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
3. Code Acceptance: Comply with applicable requirements of ICC-ES AC212.
4. Seam and joint fillers, sealants, Tapes and Accessories: As recommended by coating manufacturer.
5. Products:
    a. PROSOCO, Inc; R-GUARD Spray Wrap MVP: www.prosoco.com/r-guard.
    b. Substitutions: See Section 01 6000 - Product Requirements.

2.02 LIQUID APPLIED FLASHING MEMBRANE

A. Products:
    a. PROSOCO, Inc; FastFlash: www.prosoco.com/r-guard.
    b. Substitutions: See Section 01 6000 - Product Requirements.

B. Install according to the manufacturer’s recommendations as a component of the air barrier system or as independent flashing as show on the drawings.

2.03 SEALANTS

A. Joint sealants that comply with ASTM C920, elastomeric polymer sealant to maintain watertight conditions.
    1. Products: Sealants recommended by the weather barrier manufacturer.

B. Primers, Cleaners, and Other Sealant Materials: As recommended by sealant manufacturer, appropriate to application, and compatible with adjacent materials.

2.04 ACCESSORIES

A. Seam and joint fillers, sealants, Tapes, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.

B. Thinners and Cleaners: As recommended by material manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
    1. Install weather barrier prior to installation of window and door frames.
    2. Install weather barrier in a horizontal manner starting at the lower portion of the wall surface with subsequent layers installed in a shingling manner to overlap lower layers.

C. Coatings:
    1. Prepare substrate in manner recommended by coating manufacturer; treat joints in substrate and between dissimilar materials as recommended by manufacturer.
    2. Use flashing to seal to adjacent construction and to bridge joints.

D. Openings and Penetrations in Exterior Weather Barriers:

1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with at least 4 inches wide; do not seal sill flange.
3. At openings to be filled with non-flanged frames, seal weather barrier to all sides of opening framing, using flashing at least 9 inches wide, covering entire depth of framing.
4. At head of openings, install flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

3.05 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

SECTION 07 42 13.13
FORMED METAL WALL AND SOFFIT PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured metal wall panels with related flashings and accessory components.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

B. Section 01 6000 - Product Requirements: Substitution procedures.

C. Section 05 4000 – Cold-Formed Metal Framing.

D. Section 07 6200 - Sheet Metal Flashing and Trim: Metal cap flashing over metal siding.

E. Section 07 9000 - Joint Sealants.

1.03 REFERENCE STANDARDS

A. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2013.

1.04 DESIGN REQUIREMENTS

A. System: Preformed and prefinished metal siding system.

B. Maximum Allowable Deflection of Panel: L/120 of span.

C. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement within system; movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Submit shop drawings consisting of design and erection drawings, finish specifications and other data necessary to clearly describe the design, materials, sizes, layouts, construction details and erection. Submit small-scale layouts of panels and large-scale details of edge conditions, joints, fastener and sealant placement, flashings, penetrations, copings and special details. Distinction must be made between factory and field assembled work.

C. Samples: Submit two samples of wall panel, 12 inch by 12 inch in size illustrating finish color, sheen, and texture.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years of experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

B. Store prefinished material off ground and protected from weather. Prevent twisting, bending, or abrasion, and provide ventilation to stored materials. Slope metal sheets to ensure drainage.

C. Prevent contact with materials that may cause discoloration or staining of products.

1.08 WARRANTY

A. See Section 01 7250 – Warranties, Operation and Maintenance Data, for additional warranty requirements.

B. Correct defective work within a five year period after Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Morin Corporation, www.morincorp.com .

B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MANUFACTURED METAL PANELS

A. Wall Panel and Soffit Panels: Preformed and prefinished metal panel system with concealed fasteners.

Material: 22 gage Aluminum-zinc alloy-coated Steel Sheet: ASTM A 792/A 792M, structural quality, Grade 50, Coating Class AZ55 (Grade 340, Class AZM 165 unpainted Galvalume Plus Coating.
Panel Fasteners: Self-tapping screws and other acceptable corrosion-resistant fasteners recommended by panel manufacturer. Supply fasteners with EPDM or neoprene gaskets with heads matching color of metal panels by means of factory applied coating.

1. MWP 1 Wall Panel– Matrix MX-1
2. MWP 2 Wall Panel and Soffit panel and/ or back of parapet - F-12-0
3. MWP 3 Soffit panel - F-12-0

B. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.

C. Trim, Closure Pieces, Caps, and Flashings: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

D. Anchors: Galvanized steel.

2.03 MATERIALS

A. Precoated aluminum Sheet: continuous coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.

B. Exposed Finish Coatings: Panel manufacturer's standard 0.8 mil 70% Kynar or Hylar 5000 color coat, over 0.8 mil primer. Color as selected from manufacturer's full range colors.

2.04 ACCESSORIES

A. Sealants: Specified in Section 07 9200. Manufacturer's standard type suitable for use with installation of system; non-staining; color as selected.

B. Concealed Fasteners: Manufacturer's standard type to suit application.

C. Power Actuated Fasteners: Stainless steel; with soft neoprene washers, fastener cap same color as exterior panel.

D. Field Touch-up Paint: As recommended by panel manufacturer.

E. Bituminous Paint: Asphalt base.

2.05 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest practicable lengths.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that framing members are ready to receive panels.

3.02 INSTALLATION

A. Securely install panels on framing in accordance with manufacturer's instructions.

B. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint. Allow to dry prior to installation.

C. Fasten panels; aligned, level, and plumb.

D. Locate joints over supports. Lap panel ends minimum 2 inches.

E. Provide expansion joints where recommended by panel manufacturer.

3.03 TOLERANCES

A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch.

B. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch.

3.04 CLEANING

A. Remove site cuttings from finish surfaces.

B. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

END OF SECTION

SECTION 07 42 64
METAL COMPOSITE MATERIAL WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Self-supporting exterior curtain wall system consisting of formed metal composite material (MCM) sheet, framing, secondary supports, and anchors to structure.

B. Matching flashing and trim.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

B. Section 01 6000 - Product Requirements: Substitution procedures.

C. Section 05 4000 - Cold-Formed Metal Framing: Panel support framing.

D. Section 07 6200 - Sheet Metal Flashing and Trim: Metal flashing components integrated with this wall system.

E. Section 07 9005 - Joint Sealers.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2013.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

D. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2015.

E. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; 2014a.

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2013.

G. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

H. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2010.

I. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

J. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.

K. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

L. ASTM D523 - Standard Test Method for Specular Gloss; 2014.

M. ASTM D1781 - Standard Test Method for Climbing Drum Peel for Adhesives; 1998 (Reapproved 2012).

N. ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics; 2013a.

O. ASTM D2244 - Standard Practice for Calculation of Color Differences from Instrumentally Measured Color Coordinates; 2011.

P. ASTM D4145 - Standard Test Method for Coating Flexibility of Prepainted Sheet; 2010.

Q. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films; 2007.

R. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2014.

S. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

T. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

U. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors By Uniform Static Air Pressure Difference; 2000 (Reapproved 2009).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Meeting: Convene one week before starting work of this section to verify project requirements, co-ordinate with installers of other work, establish condition and completeness of building substrate, and review manufacturers' installation instructions and warranty requirements.
   1. Require attendance by the installer and relevant sub-contractors.
   2. Review procedures for protection of work and other construction.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Wall System Manufacturer Qualifications.

C. Product Data - MCM Sheets: Manufacturer's data sheets on each product to be used, including thickness, physical characteristics, and finish, and:
   1. Finish manufacturer's data sheet showing physical and performance characteristics.
   2. Storage and handling requirements and recommendations.
   3. Fabrication instructions and recommendations.
   4. Sealant product data.
   5. Specimen warranty for finish, as specified herein.

D. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
   1. Physical characteristics of components shown on shop drawings.
   2. Storage and handling requirements and recommendations.
   3. Installation instructions and recommendations.
   4. Specimen warranty for wall system, as specified herein.

E. Shop Drawings: Show layout and elevations, dimensions and thickness of panels, connections, details and location of joints, sealants and gaskets, method of anchorage, number of anchors, supports, reinforcement, trim, flashings, and accessories.
   1. Indicate panel numbering system.
   2. Differentiate between shop and field fabrication.
   3. Indicate substrates and adjacent work with which the wall system must be coordinated.
   4. Include large-scale details of anchorages and connecting elements.
   5. Include large-scale details or schematic, exploded or isometric diagrams to fully explain flashing at a scale of not less than 1-1/2 inches per 12 inches.
   6. Include design engineer's stamp or seal on shop drawings for attachments, supports and anchors.

F. Design Data: Submit structural calculations stamped by design engineer, for Architect's information and project record.

G. Verification Samples: For each finish product specified, minimum size 12 inches square, representing actual product in color and texture.

H. Test Report: Submit report of full-size mock-up tests for air infiltration, water penetration, and wind performance.

I. Installer’s Qualifications.

J. Certificate: Certify that the work results of this section meet or exceed specified requirements.

K. Manufacturer's Qualification Statement.

L. Installer's Qualification Statement.

M. Testing Agency's Qualification Statement.

N. Maintenance Data: Care of finishes and warranty requirements.

O. Executed Warranty: Submit warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Field Measurements: Verify actual dimensions by field measurement before fabrication; show recorded measurements on shop drawings.

B. Design Engineer's Qualifications: Design structural supports and anchorages under direct supervision of a Structural Engineer experienced in design of this type of Work and licensed in the State in which the Project is located.

C. Wall System Manufacturer Qualifications: Company specializing in manufacturing products specified in this section.
   1. With not less than three years of documented experience.
   2. Approved by MCM sheet manufacturer.

D. Installer Qualifications: Company specializing in performing work of the type specified in this section.
   1. With minimum 3 years of documented experience.
   2. Approved by wall system manufacturer.

E. Testing Agency Qualifications: Independent agency experienced in testing assemblies of the type required for this project and having the necessary facilities for full-size mock-up testing of the type specified.

F. Mock-Up: Provide a mock-up for evaluation of fabrication workmanship.
   1. Locate where directed.
   2. Provide panels finished as specified.
   3. Mock-up may remain as part of the Work if approved by Architect.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
   1. Protect finishes by applying heavy duty removable plastic film during production.
   2. Package for protection against transportation damage.
   3. Provide markings to identify components consistently with drawings.
   4. Exercise care in unloading, storing and installing panels to prevent bending, warping, twisting and surface damage.

B. Store products protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
   1. Store in well ventilated space out of direct sunlight.
   2. Protect from moisture and condensation with tarpaulins or other suitable weather tight covering installed to provide ventilation.
   3. Store at a slope to ensure positive drainage of any accumulated water.
   4. Do not store in any enclosed space where ambient temperature can exceed 120 degrees F.
   5. Avoid contact with any other materials that might cause staining, denting, or other surface damage.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Wall System Warranty: Provide joint written warranty by manufacturer and installer, agreeing to correct defects in manufacturing or installation within a two year period after Date of Substantial Completion.

C. MCM Sheet Manufacturer’s Finish Warranty: Provide manufacturer's written warranty stating that the finish will perform as follows for minimum of 20 years:
   1. Chalking: No more than that represented by a No.8 rating based on ASTM D4214.
   2. Color Retention: No fading or color change in excess of 5 Hunter color difference units, calculated in accordance with ASTM D2244.
   3. Gloss Retention: Minimum of 30 percent gloss retention, when tested in accordance with ASTM D523.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Composite Material Sheet Manufacturers:
   1. 3A Composites USA: www.alucobondusa.com.
   2. Alcoa, Inc: www.alcoa.com.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 WALL PANEL SYSTEM

A. Wall Panel System: Metal panels, fasteners, and anchors designed to be supported by framing or other substrate provided by others; provide installed panel system capable of maintaining specified performance without defects, damage or failure.
   1. Provide structural design by or under direct supervision of a Structural Engineer licensed in the State in which the Project is located.
   2. Provide panel jointing and weatherseal using a "wet," sealant sealed system.
   3. Anchor panels to supporting framing without exposed fasteners.

B. Performance Requirements:
   1. Thermal Movement: Provide for free and noiseless vertical and horizontal thermal movement due to expansion and contraction under material temperature range of minus 20 degrees F to 180 degrees F without buckling, opening of joints, undue stress on fasteners, or other detrimental effects; allow for ambient temperature at time of fabrication, assembly, and erection procedures.
   2. Wind Performance: Provide system tested in accordance with ASTM E330/E330M without permanent deformation or failures of structural members under the following conditions:
      a. Design Wind Pressure: As specified in in 2012 IBC and local building codes.
      b. Maximum deflection of perimeter framing member of L/175 normal to plane of the wall; maximum deflection of individual panels of L/60.
      c. Maximum anchor deflection in any direction of 1/16 inch at connection points of framing members to anchors.
   3. Air Infiltration: 0.06 cfm/sq ft of wall area, maximum, when tested at 1.57 psf in accordance with ASTM E283.
   4. Water Penetration: No water penetration under static pressure when tested in accordance with ASTM E331 at a differential of 10 percent of inward acting design load, 6.24 psf minimum, after 15 minutes.
      a. Water penetration is defined as the appearance of uncontrolled water on the interior face of the wall.
      b. Design to drain leakage and condensation to the exterior face of the wall.

C. Panels: One inch deep pans formed of metal composite material sheet by routing back edges of sheet, removing corners, and folding edges.
   1. Reinforce corners with riveted aluminum angles.
   2. Provide concealed attachment to supporting structure by adhering attachment members to back of panel; attachment members may also function as stiffeners.

3. Maintain maximum panel bow of 0.8 percent of panel dimension in width and length; provide stiffeners of sufficient size and strength to maintain panel flatness without showing local stresses or read-through on panel face.
4. Secure members to back face of panels using structural silicone sealant approved by MCM sheet manufacturer.
5. Fabricate panels under controlled shop conditions.
6. Where final dimensions cannot be established by field measurement before commencement of manufacturing, make allowance for field adjustments without requiring field fabrication of panels.
7. Fabricate as indicated on drawings and as recommended by MCM sheet manufacturer.
   a. Make panel lines, breaks, curves and angles sharp and true.
   b. Keep plane surfaces free from warp or buckle.
   c. Keep panel surfaces free of scratches or marks caused during fabrication.
8. Provide joint details providing a watertight and structurally sound wall panel system that allows no uncontrolled water penetration on inside face of panel system.

2.03 MATERIALS

A. Metal Composite Material (MCM) Sheet: Two sheets of aluminum sandwiching a solid core of extruded thermoplastic material formed in a continuous process with no glues or adhesives between dissimilar materials; core material free of voids and spaces; no foamed insulation material content.
   1. Overall Sheet Thickness: 3 mm, minimum.
   2. Face Sheet Thickness: 0.019 inches, minimum.
   3. Alloy: Manufacturer's standard, selected for best appearance and finish durability.
   4. Bond and Peel Strength: No adhesive failure of the bond between the core and the skin nor cohesive failure of the core itself below 22.4 inch-pound/inch with no degradation in bond performance, when tested in accordance with ASTM D1781, simulating resistance to panel delamination, after 8 hours of submersion in boiling water and after 21 days of immersion in water at 70 degrees F.
   5. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
   6. Flammability: Self-ignition temperature of 650 degrees F or greater, when tested in accordance with ASTM D1929.
   7. Factory Finish: Two coat mica coating, approved by the coating manufacturer for the length of warranty specified for the project, and applied by coil manufacturing facility that specializes in coil applied finishes.
      a. Coating Flexibility: Pass ASTM D4145 minimum 1T-bend, at time of manufacturing.
      b. Long-Term Performance: Not less than that specified under WARRANTY in PART 1.
   8. Color/Texture: As selected by Architect from manufacturer's standard range.

B. Metal Framing Members: Include all sub-girts, zee-clips, base and sill angles and channels, hat-shaped and rigid channels, and furring channels required for complete installation.
   1. Provide material strength, dimensions, configuration as required to meet the applied loads applied and in compliance with applicable building code.
   2. Stud Framing Materials: Minimum 16 ga.
   3. Sheet Steel Components: ASTM A653/A653M galvanized to G90/Z275 or zinc-iron alloy-coated to A60/ZF180; or ASTM A792/A792M aluminum-zinc coated to AZ60/AZM180.
   4. Stainless Steel Sheet Components: ASTM A480/A480M.
   5. Aluminum Components: ASTM B209 (B209M); or ASTM B221.

C. Flashing: Sheet aluminum; 0.040 inch thick, minimum; finish and color to match MCM sheet

D. Roofing Underlayment: Self-adhered membrane composed of rubberized asphalt adhesive and high density cross laminated polyethylene, 40 mils thickness.
   1. Equal to Grace Ice and Water Shield.

E. Anchors, Clips and Accessories: Use one of the following:

1. Stainless steel complying with ASTM A276/A276M, ASTM A480/A480M, or ASTM A666.
2. Steel complying with ASTM A36/A36M and hot-dipped galvanized to ASTM A153/A153M.
3. Steel complying with ASTM A36/A36M and hot-dipped galvanized to ASTM A123/A123M Coating Grade 10.

F. Fasteners:
1. Exposed fasteners: Stainless steel; permitted only where absolutely unavoidable and subject to prior approval of the Architect.
2. Screws: Self-drilling or self-tapping Type 410 stainless steel or zinc-alloy steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of metal wall panels.
3. Bolts: Stainless steel.
4. Fasteners for Flashing and Trim: Blind fasteners of high-strength aluminum or stainless steel.

G. Bituminous Coating: Cold-applied asphalt mastic, noncorrosive compound free of asbestos, sulfur, and other deleterious impurities; 15 mil dry film thickness per coat.

H. Joint Sealer: Silicone sealant approved by MCM sheet manufacturer. Color to match panels.

I. Provide panel system manufacturer's and installer’s standard corrosion resistant accessories, including fasteners, clips, anchorage devices and attachments.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and interfaces with other work.

B. Verify substrate on-site to determine that conditions are acceptable for product installation in accordance with manufacturers written instructions.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

D. Notify Architect in writing of conditions detrimental to proper and timely completion of work. Do not proceed with erection until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Protect adjacent work areas and finish surfaces from damage during installation.

3.03 INSTALLATION

A. Do not install products that are defective, including warped, bowed, dented, and broken members, and members with damaged finishes.

B. Comply with instructions and recommendations of MCM sheet manufacturer and wall system manufacturer, as well as with approved shop drawings.

C. Install wall system securely allowing for necessary thermal and structural movement; comply with wall system manufacturer's instructions for installation of concealed fasteners.

D. Do not handle or tool products during erection in manner that damages finish, decreases strength, or results in visual imperfection or failure in performance. Return component parts that require alteration to shop for refabrication, if possible, or for replacement with new parts.

E. Do not form panels in field unless required by wall system manufacturer and approved by the Architect; comply with MCM sheet manufacturer's instructions and recommendations for field forming.

F. Separate dissimilar metals; use gasket fasteners, isolation shims, or isolation tape where needed to eliminate possibility of electrolytic action between metals.

G. Where joints are designed for field applied sealant, seal joints completely with specified sealant.

H. Apply roofing membrane to all horizontal surfaces under composite metal panels. At intersection of horizontal and vertical surfaces extend membrane vertically minimum of 8 inches up or down.

I. Apply membrane such that all laps shed water. Apply membrane from low point of roof to high point.

J. Install flashings as indicated on shop drawings. At flashing butt joints, provide a lap strap under flashing and seal lapped surfaces with a full bed of non-hardening sealant.

K. Install square, plumb, straight, and true, accurately fitted, with tight joints and intersections maintaining the following installation tolerances:
   1. Variation From Plane or Location: 1/2 inch in 30 feet of length and up to 3/4 inch in 300 feet, maximum.
   2. Deviation of Vertical Member From True Line: 0.1 inch in 25 feet run, maximum.
   3. Deviation of Horizontal Member From True Line: 0.1 inch in 25 feet run, maximum.
   4. Offset From True Alignment Between Two Adjacent Members Abutting End To End, In Line: 0.03 inch, maximum.

L. Replace damaged products.
   1. Exception: Field repairs of minor damage to finishes are permitted only when approved in writing by Architect, panel manufacturer, and fabricator.
   2. Field Repairs to Finishes: Using materials and methods sufficient that repairs are not discernible when viewed at distance of 10 feet under all typical light conditions experienced at the project.

3.04 CLEANING

A. Ensure weep holes and drainage channels are unobstructed and free of dirt and sealants.

B. Remove protective film after installation of joint sealers, after cleaning of adjacent materials, and immediately prior to completion of work.

C. Remove temporary coverings and protection of adjacent work areas.

D. Clean installed products in accordance with manufacturer's instructions.

3.05 PROTECTION

A. Protect installed panel system from damage during construction.

END OF SECTION

SECTION 07 43 00
COMPOSITE METAL WALL PANELS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Exterior installation of composite metal panels.

1.02 RELATED DOCUMENTS

A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are located in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

A. In accordance with Section 01 3000.

B. Substitutions will not be considered prior to the award of the General Contract.

C. Shop Drawings:
1. Provide elevations showing seam layout and pattern.
2. Show manner of forming, joining, and securing panels to Project substrate.
3. Show expansion joint details and waterproof connections to adjoining work and at obstructions and penetrations.
4. Panel and fastener calculations to be submitted along with the panel drawings.

D. Samples consisting of 6-inch square specimens of material.

1.04 REFERENCES

A. AAMA 2605 - Specification for High Performance Organic Coatings on Architectural Extrusions and Panels; American Architectural Manufacturers Association.

B. ASTM C 297 - Standard Test Method for Tensile Strength of Flat Sandwich Constructions in Flatwise Plane; 1994.

C. ASTM D 1781 - Standard Test Method for Climbing Drum Peel for Adhesives; 1993.

D. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 1994.

E. ASTM E 108 - Standard Test Methods for Fire Tests of Roof Coverings; 1993.

F. ASTM E 283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 1991.

G. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors By Uniform Static Air Pressure Difference; 1990.

H. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors By Uniform Static Air Pressure Difference; 1993.

1.05 QUALITY ASSURANCE

A. Manufacturer: Company with a minimum of five years of continuous experience manufacturing panel systems of the type specified, and capable of providing a list of five other projects of similar size, including approximate date of installation and name of Architect for each.

B. Fabricator: Company with at least three years of experience on similar sized metal panel projects and approved by panel system manufacturer.

C. Field Measurements: Whenever possible, take field measurements prior to fabrication of panels. If schedule will not permit timely field measurements, fabricate to accommodate design dimensions within a reasonable tolerance level.

D. Field Quality Control: Comply with panel system manufacturer's recommendations and guidelines for field forming of panels.

1.06 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide MCM panel systems capable of withstanding the effects of the following loads, based on testing in accordance with ASTM E330:
1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings
3. Panel Deflection Limit:For wind loads, no greater than 1/60 of the span
4. Framing Member Deflection Limits: For wind loads, no greater than 1/175 of the span.

B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) of wall area when tested in accordance with ASTM E283 at the following test-pressure difference:
1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

C. Water Penetration under Static Pressure: No water penetration to room side of assembly when tested for 15 minutes in accordance with ASTM E331 at the following test-pressure difference:
1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

D. Thermal Movements: Locate expansion and contraction points to allow for free and noiseless thermal movements from surface temperature changes.
1. Temperature Change (Range): minus 20 deg F to 180 deg F (minus 29 to 82.2 deg C), material surfaces.

E. Fire Propagation Characteristics: MCM wall assembly passes NFPA 285 testing.failures of structural members.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protection: Protect finish of panels with by applying removable plastic film during production.

B. Delivery: Package composite wall panels for protection against transportation damage. Provide markings to identify components consistently with drawings.

C. Handling: Exercise care in unloading, storing, and installing panels to prevent bending, warping, twisting, and surface damage.

D. Storage: Store panels in well-ventilated space out of direct sunlight. Protect panels from moisture and condensation with tarpaulins or other suitable weathertight covering installed to provide ventilation. Slope panels to insure positive drainage of any accumulated water. Do not store panels in any enclosed space where ambient temperature can exceed 120 degrees F. Avoid contact with any other materials that might cause staining, denting, or other surface damage.

1.08 WARRANTY

A. Submit manufacturer's warranty as follows:
1. 10 year panel integrity
2. 20 year finish, Delta E 5 / Chalk Maximum 8

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide ALUCOBOND PLUS FR; 3A Composites USA Inc. or comparable product by:
1. Mitsubishi Plastics Composites America, Inc.: Alpolic FR
2. Peterson Aluminum Corp.: PAC-3000 FR
3. ALFREX FR
4. Reynobond by Alcoa

B. Provide Drain-Back Ventilated Rainscreen System.

2.02 COMPOSITE METAL PANELS

A. Core: Thermoplastic material that meets performance characteristics specified when fabricated into composite assembly.

B. Face Sheets: Aluminum 3105-H14 alloy, 0.020 inch thick bonded in continuous process without glues or adhesives to core material.
1. Bond Integrity: Tested for resistance to delamination as follows:
2. Peel Strength: 22.5 Inch lbs./inch minimum, per ASTM D 1781.
3. No change in bond performance after 8 hours of submersion in boiling water and after 21 days of immersion in water at 70 degrees F.

C. Fire Performance:
1. Flame Spread: 0, when tested per ASTM E 84.
2. Smoke Developed: 10 maximum, when tested per ASTM E 84.

D. Production Tolerances:
1. Width: Plus or minus 0.08 inch.
2. Length: Plus or minus 0.16 inch.
3. Thickness: Plus or minus 0.008 inch (4 mm panel).
4. Thickness: Plus or minus 0.012 inch (6 mm panel).
5. Bow: Maximum 0.5 percent length or width.
6. Squareness: Maximum 0.2 inch.

E. Panel Thickness: 4 mm.

F. Finish: Kynar 500 based polyvinylidene fluoride (PVDF) coating, 70% resin formulation. Custom and Standard Colors to be selected by Architect.
1. ACP-1 Custom Gray Color to be selected
2. ACP-2 Custom Blue Color to be selected
3. ACP-3 Custom Yellow Color to be selected

2.03 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C645, cold-formed, metallic-coated steel sheet ASTM A653/A653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A792/A792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide Fabricator's standard sections as required for support and alignment of MCM panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of MCM panels unless otherwise indicated.

C. Flashing and Trim: Provide flashing and trim formed from same material as MCM panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent MCM panels.
1. Basis-of-Design Product: Subject to compliance with requirements, provide ALUCOBOND®; 3A Composites USA Inc.; ALUCOBOND® Axcent™ Trim or approved equal.
2. Aluminum Trim: Formed with 0.040-inch (1.00-mm-) thick, coil-coated aluminum sheet facings.
3. Color: To match ACP color selections

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of MCM panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

2.04 FABRICATION

A. General: Fabricate and finish MCM panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Fabricate MCM panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations or recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
   a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that conditions are acceptable for installation of composite metal panels before beginning work; do not proceed with the work until conditions have been corrected to Architect's

acceptance.

3.02 MCM PANEL INSTALLATION

A. General: Install MCM panels in accordance with Fabricator's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to supports unless otherwise indicated. Anchor MCM panels and other components of the Work securely in place, with provisions for thermal and structural movement.
   1. Shim or otherwise plumb substrates receiving MCM panels.
   2. Flash and seal MCM panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by MCM panels are installed.
   3. Install screw fasteners in predrilled holes.
   4. Locate and space fastenings in uniform vertical and horizontal alignment.
   5. Install flashing and trim as MCM panel work proceeds.
   6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
   7. Align bottoms of MCM panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
   8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners: Use aluminum or stainless steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by MCM panel manufacturer.

D. Attachment Assembly, General: Install attachment assembly required to support MCM wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.
   1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.

E. Panel Installation: Attach MCM wall panels to supports at locations, spacings, and with fasteners recommended by Fabricator to achieve performance requirements specified.
   1. DBVR System: Install using Fabricator's standard assembly with vertical channel that provides support and secondary drainage assembly, draining at base of wall. Notch vertical channel to receive support pins. Install vertical channels supported by channel brackets or adjuster angles and at locations, spacings, and with fasteners recommended by Fabricator. Attach MCM wall panels by inserting horizontal support pins into notches in vertical channels and into flanges of panels. Leave horizontal and vertical joints with open reveal.
      a. Track-Support Installation: Install support assembly at locations, spacings, and with fasteners recommended by manufacturer. Use Fabricator's standard horizontal tracks and vertical [tracks] [drain channels] that provide support and secondary drainage assembly, draining to the exterior at horizontal joints through drain tube. Attach MCM wall panels to tracks by interlocking panel edges with Fabricator's standard "T" clips.
      b. Panel Installation:
         1) Attach routed-and-returned flanges of wall panels to perimeter extrusions with manufacturer's standard fasteners.
         2) Install wall panels to allow individual panels to "free float" and be installed and removed without disturbing adjacent panels.
      c. Joint Sealing: Seal all joints in accordance with AAMA 509. Do not apply sealants to joints unless otherwise indicated.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
   1. Install components required for a complete MCM panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by MCM panel Fabricator; or, if not indicated, provide types recommended in writing by MCM system Fabricator.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, or SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.
   1. Install exposed flashing and trim that is without buckling and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof performance.
   2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (605 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.03 ADJUSTING AND CLEANING

A. Repair panels with minor damage so that repairs are not discernible at a distance of 10 feet.

B. Remove and replace panels damaged beyond repair.

C. Remove protective film immediately after installation of joint sealers and immediately prior to completion of composite metal panel work.

D. Remove from project site damaged panels, protective film, and other debris attributable to work of this section.

3.04 PROTECTION

A. Institute protective measures as required to assure that installed panels will not be damaged by continuing construction activities.

END OF SECTION

SECTION 07 52 50
MODIFIED BITUMEN SHEET ROOFING

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. Preparation of Substrate to Receive Roofing Materials

B. Roof Insulation Application to Prepared Substrate

C. Roof Membrane Application

D. Roof Flashing Application

E. Incorporation of Sheet Metal Flashing Components and Roofing Accessories into the Roof System

1.02 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Sheet Metal Flashing and Trim

B. Sheet Metal Roofing Specialties

1.03 RELATED DOCUMENTS

A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are located in Division 1 of the Specifications.

1.04 SUBMITTALS AND SUBSTITUTIONS

A. In accordance with Section 01 3000.

B. Substitutions will not be considered prior to the award of the General Contract.

1.05 REFERENCE STANDARDS

A. References in these specifications to standards, test methods and codes, are implied to mean the latest edition of each such standard adopted. The following is an abbreviated list of associations, institutions, and societies which may be used as references throughout this specification section.

ASTM American Society for Testing and Materials
Philadelphia, PA

NRCA National Roofing Contractors Association
Rosemont, IL

OSHA Occupational Safety and Health Administration
Washington, DC

SMACNA Sheet Metal and Air Conditioning Contractors National Association
Chantilly, VA

UL Underwriters Laboratories
Northbrook, IL

1.06 QUALITY ASSURANCE

A. Acceptable Products: Primary roofing products, including each type of sheet, all manufactured in the United States, shall be supplied by a single manufacturer which has been successfully producing the specified types of primary products for not less than 10 years. The primary roofing products shall have maintained a consistent composition for a minimum of five years.

B. Product Quality Assurance Program: Primary roofing materials shall be manufactured under a quality management system that is monitored regularly by a third party auditor under the ISO 9001 audit process. A certificate of analysis for reporting/confirming the tested values of the actual material being supplied for the project will be required prior to project close-out.

C. Agency Approvals: The proposed roof system shall conform to the following requirements. No other testing agency approvals will be accepted.
1. Underwriters Laboratories Class A acceptance of the proposed roofing system.
2. Evidence by an accredited independent testing agency or agencies that the roof configuration meets a design windload pressure of - 45 psf or greater.

D. Acceptable Contractor: Contractor shall have a minimum of 2 years experience in successfully installing the same or similar roofing materials and be certified in writing by the roofing materials manufacturer to install the primary roofing products.

E. Scope of Work: The work to be performed under this specification shall include but is not limited to the following: Attend necessary job meetings and furnish competent and full time supervision, experienced roof mechanics, all materials, tools, and equipment necessary to complete, in an acceptable manner, the roof installation in accordance with this specification. Comply with the latest written application instructions of the manufacturer of the primary roofing products. In addition, application practice shall comply with requirements and recommendations contained in the latest edition of the Handbook of Accepted Roofing Knowledge (HARK) as published by the National Roofing Contractor's Association, amended to include the acceptance of a phased roof system installation.

F. Local Regulations: Conform to regulations of public agencies, including any specific requirements of the city and/or state of jurisdiction.

G. Manufacturer Requirements: Ensure that the primary roofing materials manufacturer provides direct trained company personnel to attend necessary job meetings, perform periodic inspections as necessary, and conducts a final inspection upon successful completion of the project.

1.07 PRODUCT DELIVERY STORAGE AND HANDLING

A. Delivery: Deliver materials in the manufacturer's original sealed and labeled containers and in quantities required to allow continuity of application.

B. Storage: Store materials out of direct exposure to the elements on pallets placed over clean, flat and dry surfaces. Storage of pallets over dirt, grass-covered ground or newly placed concrete may result in upward moisture transpiration and contamination of product. Store rolls of roofing on end. For roof-top storage, avoid overloading of deck and building structure. Factory packaging is not intended for job site protection. Slit factory packaging immediately upon arrival at the job site to prevent build-up of condensation and cover

materials using a breathable cover such as a canvas. Polyethylene or other non-breathable plastic coverings shall not be used. Store flammable or temperature sensitive materials away from open flame, ignition sources or excessive heat.

C. Handling: Handle all materials in such a manner as to preclude damage and contamination with moisture or foreign matter. Handle rolled goods to prevent damage to edges or ends.

D. Damaged Material: Any materials that are found to be damaged or stored in any manner other than stated above will be automatically rejected, and will require removal and replacement at the Contractor's expense.

1.08 PROJECT/SITE CONDITIONS

A. Requirements Prior to Job Start
1. Notification: Give a minimum of 5 days notice to the Owner and manufacturer prior to commencing any work and notify both parties on a daily basis of any change in work schedule.
2. Permits: Obtain all permits required by local agencies and pay all fees which may be required for the performance of the work.
3. Safety: Familiarize every member of the application crew with all fire and safety regulations recommended by OSHA, NRCA and other industry or local governmental groups.

B. Environmental Requirements
1. Precipitation: Do not apply roofing materials during precipitation or in the event there is a probability of precipitation during application. Take adequate precautions to ensure that materials, applied roofing, and building interiors are protected from possible moisture damage or contamination.
2. Temperature Restrictions - cold adhesive: At low temperatures, the specified cold adhesive becomes more viscous, making even distribution more difficult. The optimal temperature of the adhesive at point of application is 70° - 100°F (21° - 38°C). To facilitate application when ambient temperatures are below 50°F (10°C), store the adhesive and roll goods in a warm place immediately prior to use. Bulk warmers, inline heaters, or other pre-heating equipment should be used to maintain the proper viscosity of the adhesive when using mechanical application equipment. Consider "flying in" the pre-cut roofing sheets in by placing them into the adhesive rather than rolling them into position. Roll or broom the sheets to ensure contact with the underlying adhesive. Suspend application in situations where the adhesive cannot be kept at temperatures allowing for even distribution.
3. Temperature Restrictions - self-adhesive sheets: The minimum required substrate temperature at point of application is 40°F (4°C). Maintain a minimum roof membrane material temperature above 60° F (16° C). In low temperature conditions, keep materials warm prior to application. Consider using the specified tacky primer, required for vertical applications, in temperatures below 60° F (16° C) to facilitate proper bonding of self-adhered membrane for horizontal applications. The minimum ambient temperature range at the time of tacky primer application is 45°F to 105°F (7°C - 40°C). Suspend application in situations where the self-adhered base ply cannot be kept at temperatures allowing for proper adhesion.

C. Protection Requirements
1. Membrane Protection: Provide protection against staining and mechanical damage for newly applied roofing and adjacent surfaces throughout this project.
2. Torch Safety: Crew members handling torches shall be trained by an Authorized Certified Roofing Torch Applicator (CERTA) Trainer, be certified according to CERTA torch safety guidelines as published by the National Roofing Contractor's Association (NRCA), and follow torch safety practices as required by the contractor's insurance carrier. Designate one person on each crew to perform a daily fire watch. The designated crew member shall watch for fires or smoldering

materials on all areas during roof construction activity, and for the minimum period required by CERTA guidelines after roofing material application has been suspended for the day.

3. Limited Access: Prevent access by the public to materials, tools and equipment during the course of the project.
4. Debris Removal: Remove all debris daily from the project site and take to a legal dumping area authorized to receive such materials.
5. Site Condition: Complete, to the owner's satisfaction, all job site clean-up including building interior, exterior and landscaping where affected by the construction.

1.09 GUARANTEE/WARRANTY

A. Roof Membrane/System Guarantee: Upon successful completion of the project, and after all post installation procedures have been completed, furnish the Owner with the manufacturer's 20 year labor and materials guarantee covering the rigid insulation, insulation fasteners/plates, insulation adhesive, and roof membrane/flashing system. The guarantee shall be a term type, without deductibles or limitations on coverage amount, and shall be issued at no additional cost to the Owner.
> Siplast 20 year Roof Membrane/System Guarantee

B. General Contractor and Roofing Subcontractor: Required to jointly and separately provide written guarantee that the roofing and flashing will be weathertight and free from defects in materials and workmanship for a period of 2 years from Final Acceptance Date.
1. Leaks and defects include blistering, fishmouths, ridging, splits, open laps, buckles, wrinkles and slippage. Make corrections at Contractor's expense during guarantee period.
2. Roofing inspection and written acceptance by manufacturer, Architect, and Owner will be required. In addition, roofing subcontractor is to schedule a joint inspection by above named parties 60 days prior to expiration of 2 year guarantee and correct defects complying with original specifications.

PART 2 - PRODUCTS

2.01 ROOF ASSEMBLIES

A. ASSEMBLY 1 (TYPICAL)

Manufacturer: Dasis of Design: Siplast
Alternate Manufacturers: Firestone, Manville

Product: Paradiene 30 FR BW; Modified Bitumen Roofing System with Highly Reflective Surface Granules
Paradiene 20

Attachment: Siplast PA-311 R Adhesive

System: (exterior side)
1. Modified Bitumen Roofing System
2. Over ¼" Dens Deck Prime Cover Board Para-Stik Insulation Adhesive.
3. Over Tapered Paratherm system, providing for a roof slope of 1/4 inch, applied in Para-Stik Insulation Adhesive.
4. Over Siplast Paratherm CG Insulation (R-26 Min.) mechanically attached
5. Over Structural Metal Deck

Flashing System: Veral Aluminum, torch applied.

B. ASSEMBLY 2 (AUDITORIUM CONDITION)

Manufacturer: Basis of Design: Siplast
Alternate Manufacturers: Firestone, Manville

Product: Paradiene 30 FR BW; Modified Bitumen Roofing System with Highly Reflective Surface Granules
Paradiene 20
Attachment: Siplast PA-311 R Adhesive
System: (exterior side)

1. Modified Bitumen Roofing System
2. Over 5/8" Dens Deck Prime Cover Board adhesive attached.
3. Over Tapered Paratherm system, providing for a roof slope of 1/4 inch, applied in Para-Stik Insulation Adhesive.
4. Over Siplast Paratherm CG Insulation (R-26 Min.) applied in Para-Stik Insulation Adhesive
5. Over 5" Roxul insulation adhesive attached
6. Over 5/8" Dens Deck Prime mechanically attached thru top of the high flute and screw not extending beyond the bottom of the low flute.
7. Over Structural Metal Deck

Flashing System: Veral Aluminum, torch applied.

2.02 ROOFING SYSTEM ASSEMBLY/PRODUCTS

A. Rigid Roof Insulation: Roof insulation shall be UL and FM approved. Insulation shall be approved in writing by the insulation manufacturer for intended use and for use with the specified roof assembly.

1. Polyisocyanurate: A closed cell, rigid polyisocyanurate foam core material, integrally laminated between glass fiber reinforced organic facers, in full compliance with ASTM C 1289, Type II, Class 1, Grade 2 (20 psi). Panels shall have a nominal thickness of 1.8 inches. Acceptable types are as follows:
   > Paratherm by Siplast; Irving, TX
2. Mineral Wool Fiber: A panel composed of a mineral wool fiber made from basalt rock and slag. Panels shall be water repellant yet vapor permeable with an approximate melting point of 2150°F. Provide panels having a nominal thickness of 3 inches. Acceptable types are as follows:
   > Toprock DD Plus, by Roxul, Inc.; Milton, ON
3. Gypsum Sheathing Panel: A panel composed of a gypsum based, non-structural water resistant core material integrally bonded with fiberglass mats on both sides having a nominal thickness of 5/8 inch. The panel surface shall be factory primed with a non-asphaltic primer. Acceptable types are as follows:
   > DensDeck Prime Gypsum Roof Board, by Georgia Pacific Corporation; Atlanta, GA
4. Polyisocyanurate Tapered Roof Insulation: Tapered panels and standard fill panels composed of a closed cell, rigid polyisocyanurate foam core material, integrally laminated between glass fiber reinforced organic facers, in full compliance with ASTM C 1289, Type II, Class 1, Grade 2 (20 psi). The tapered system shall provide for a roof slope of 1/4 inch per foot. Acceptable types are as follows.
   > Tapered Paratherm by Siplast; Irving, TX
5. Polyisocyanurate Crickets: Tapered panels and standard fill panels composed of a closed cell, rigid polyisocyanurate foam core material, integrally laminated between glass fiber reinforced organic facers, in full compliance with ASTM C 1289, Type II, Class 1, Grade 2 (20 psi). The cricket system shall provide for a roof slope of 1/2 inch per foot. Acceptable types are as follows.
   > Tapered Paratherm by Siplast; Irving, TX

2.03 DESCRIPTION OF SYSTEMS

A. Roofing Membrane Assembly: A roof membrane assembly consisting of two plies of a prefabricated, reinforced, homogeneous Styrene-Butadiene-Styrene (SBS) block copolymer

modified asphalt membrane, applied over a prepared substrate. Reinforcement mats shall be impregnated/saturated and coated each side with SBS modified bitumen blend. The cross sectional area of the sheet material shall contain no oxidized or non-SBS modified bitumen. The roof system shall pass 500 cycles of ASTM D 5849 Resistance to Cyclic Joint Displacement (fatigue) at 14°F (-10°C). Passing results shall show no signs of membrane cracking or interply delamination after 500 cycles. The roof system shall pass 200 cycles of ASTM D 5849 after heat conditioning performed in accordance with ASTM D 5147. The assembly shall possess waterproofing capability, such that a phased roof application, with only the modified bitumen base ply in place, can be achieved for prolonged periods of time without detriment to the watertight integrity of the entire roof system.

> Siplast Paradiene 20 EG/30 FR BW roof system

1. Modified Bitumen Base and Stripping Ply
   > Siplast Paradiene 20
2. Modified Bitumen Finish Ply
   > Siplast Paradiene 30 FR BW

B. Flashing Membrane Assembly: A flashing membrane assembly consisting of a prefabricated, reinforced, Styrene-Butadiene-Styrene (SBS) block copolymer modified asphalt membrane with a continuous, channel-embossed metal-foil surfacing. The finish ply shall conform to ASTM D 6298 and the following physical and mechanical property requirements.

> Siplast Veral flashing system, aluminum finish

1. Cant Backing Sheet and Flashing Reinforcing Ply
   > Siplast Paradiene 20 SA
2. Metal-Clad Modified Bitumen Flashing Sheet
   > Siplast Veral Aluminum

C. Catalyzed Acrylic Resin Flashing System: A specialty flashing system consisting of a PMMA-based, fully reinforced membrane installed over a prepared or primed substrate. The flashing system consists of a catalyzed acrylic resin primer, basecoat and topcoat, combined with a non-woven polyester fleece. The use of the specialty flashing system shall be specifically approved in advance by the membrane manufacturer for each application.

> Parapro 123 Flashing System by Siplast; Irving, TX

2.04 ROOFING ACCESSORIES

A. Insulation Adhesives: A single component, moisture cured, polyurethane foam adhesive, dispensed from a portable, pre-pressurized container used to adhere insulation panels to the substrate, as well as to other insulation panels.

> Para-Stik Insulation Adhesive by Siplast; Irving, TX

B. Roofing Adhesives

1. Membrane Cold Adhesive: An asphalt, solvent blend conforming to ASTM D 4479, Type II requirements.
   > Siplast PA-311 R Adhesive by Siplast; Irving, TX
2. Mastic: An asphalt cutback mastic, reinforced with non-asbestos fibers, used as a base for setting metal flanges conforming to ASTM D 4586 Type II requirements.
   > Siplast PA-1021 Plastic Cement by Siplast; Irving, TX

C. Primers

1. Primer: An asphalt, solvent blend conforming to ASTM D 41 requirements.

> Siplast PA-1125 Asphalt Primer by Siplast; Irving, TX

2. Primer for Self-Adhesive Sheets: A quick drying, low-VOC, water-based, high-tack primer specifically designed to promote adhesion of roofing and waterproofing sheets to approved substrates. Primer shall meet South Coast Air Quality District and Ozone Transport Commission requirements.
   > Siplast TA-119 Primer by Siplast; Irving, TX

D. Sealant (horizontal applications): A moisture-curing, self-leveling elastomeric sealant designed for roofing applications. The sealant shall be approved by the roof membrane manufacturer for use in conjunction with the roof membrane materials. Acceptable types are as follows:

> Siplast PS-209 Elastomeric Sealant by Siplast; Irving, TX

E. Sealant (vertical and sloped applications): A moisture-curing, non-slump elastomeric sealant designed for roofing applications. The sealant shall be approved by the roof membrane manufacturer for use in conjunction with the roof membrane materials. Acceptable types are as follows:

> Siplast PS-715 NS Elastomeric Sealant by Siplast; Irving, TX

F. Ceramic Granules: No. 11 grade specification ceramic granules of color scheme matching the granule surfacing of the finish ply.

G. Perlite Cant Strips: A cant strip composed of expanded volcanic minerals combined with waterproofing binders. The top surface shall be pre-treated with an asphalt based coating. The face of the cant shall have a nominal 4 inch dimension.

H. Fasteners
1. Insulation Fasteners: Insulation fasteners and plates shall be FM Approved, and/or approved by the manufacturer of the primary roofing products. The insulation fasteners shall provide attachment required to meet the specified uplift performance and to restrain the insulation panels against the potential for ridging. The fastening pattern for each insulation panel to be used shall be as recommended by the insulation manufacturer and approved by the manufacturer of the primary roofing products. Acceptable insulation fastener manufacturers for specific deck types are listed below.
   a. Metal Decks: Insulation mechanical fasteners for metal decks shall be factory coated for corrosion resistance. The fastener shall conform meet or exceed Factory Mutual Standard 4470 and when subjected to 30 Kesternich cycles, show less than 15% red rust. Acceptable insulation fastener types for metal decks are listed below.
   b. A fluorocarbon coated screw type roofing fastener having a minimum 0.220 inch thread diameter. Plates used in conjunction with the fastener shall be a metal type having a minimum 3 inch diameter, as supplied by the fastener manufacturer.
      > Parafast Fastener by Siplast; Irving, TX
2. Flashing Reinforcing Sheet Fasteners for Wood/Plywood Substrates to Receive Flashing Coverage: Fasteners shall be approved by the manufacturer of the primary roofing products. Acceptable fasteners for specific substrate types are listed below.
   a. Wood/Plywood Substrates
   b. A 12 gauge, spiral or annular threaded shank, zinc coated steel roofing fastener having a minimum 1 inch head.
      > Square Cap by Maze Nails; Peru, IL
      > Simplex Cap Nail by Simplex Nails, Inc., Americus, GA

I. Walktread: A prefabricated, puncture resistant polyester core reinforced, polymer modified bitumen sheet material topped with a ceramic-coated granule wearing surface.
> Paratread Roof Protection Material by Siplast; Irving, TX

PART 3 - EXECUTION

3.01 PREPARATION

A. General: Sweep or vacuum all surfaces, removing all loose aggregate and foreign substances prior to commencement of roofing.

B. Primer for Self-Adhesive Bituminous Membranes: Apply the specified tacky primer by roller or spray in an even film. Refer to the manufacturer's literature for the approved rate of application over various substrate types. Allow the primer to dry until it leaves a slightly sticky surface without transfer when touched.

C. Asphaltic Primer: Prime metal and concrete and masonry surfaces with a uniform coating of the specified asphalt primer.

3.02 SUBSTRATE PREPARATION

A. Insulation: Install insulation panels with end joints offset; edges of the panels shall be in moderate contact without forcing applied in strict accordance with the insulation manufacturer's requirements and the following instructions. Where insulation is installed in two or more layers, stagger joints between layers Install only as much insulation as can be made watertight within the same work day.
   1. Insulation - multiple layer (Assembly 1): Mechanically attach the base layers simultaneously to the substrate, using the specified fasteners, at a rate of 1 fastener per 2.7 square feet of panel area (12 per 4' x 8' panel). Reference the published guidelines of the accredited independent testing agency referenced in Part 1.07 C2 of this specification for perimeter/corner requirements. Set the top layer of insulation in an application of the specified insulation adhesive in 3/4- to 1-inch wide beads spaced 12 inches on center in the field of the roof, 7 inches on center at the perimeter of the roof, and 4.5 inches on center in the corners of the roof. Follow the requirements and guidelines of the insulation adhesive manufacturer/supplier. Stagger the panel joints between insulation layers.
   2. Insulation - multiple layer (Assembly 2): Install all layers in an application of the specified insulation adhesive in 3/4- to 1-inch wide beads spaced 12 inches on center in the field of the roof, 7 inches on center at the perimeter of the roof, and 4.5 inches on center in the corners of the roof. Follow the requirements and guidelines of the insulation adhesive manufacturer/supplier. Stagger the panel joints between insulation layers.
   3. Crickets: Construct crickets of tapered insulation panels in a layout as indicated on the roof plan.
   4. Tapered Edge at Transitions: Field-cut, shape and install tapered edge strip at transitions of 1/4 inch or greater between substrate components to provide a smooth transition and proper support for the subsequent insulation layer or membrane/flashing system components.

3.03 ROOF MEMBRANE INSTALLATION

A. Membrane Application: Apply roofing in accordance with roofing system manufacturer's instructions and the following requirements. Application of roofing membrane components shall immediately follow application of base sheet and/or insulation as a continuous operation.

B. Aesthetic Considerations: Construction of an aesthetically pleasing overall appearance of the finished roof application is a standard requirement for this project. Make necessary preparations, utilize recommended application techniques, apply the specified materials including granules, and exercise care in ensuring that the finished application is acceptable to the Owner.

C. Membrane Adhesive Application: Membrane adhesive can be applied by roller, squeegee or spray unit. Apply cold adhesive in a smooth, even, continuous layer without breaks or voids. Utilize an application rate of 2 to 2 1/2 gal/sq (0.6 to 1.0 l/m²) over irregular or porous

substrates. Utilize an application rate of 1 1/2 to 2 gal/sq (0.6 to 0.8 kg/m²) for interply applications. Double the adhesive application rate at the end laps of granule surfaced sheets. Refer to the manufacturer's inter-ply flashing detail at the locations that are to receive the specified catalyzed acrylic resin primer/flashing system.

D. Bitumen Consistency: Cutting or alterations of bitumen, primer, and sealants will not be permitted.

E. Roofing Application: Apply all layers of roofing free of wrinkles, creases or fishmouths. Exert sufficient pressure on the roll during application to ensure prevention of air pockets.
1. Apply all layers of roofing perpendicular to the slope of the deck.
2. Fully bond the base ply to the prepared substrate, utilizing minimum 3 inch side and end laps. Apply each sheet directly behind the cold adhesive applicator. Cut a dog ear angle at the end laps on overlapping selvage edges. Using a clean trowel, apply top pressure to top seal T-laps immediately following sheet application. Stagger end laps a minimum of 3 feet.
3. Fully bond the finish ply to the base ply, utilizing minimum 3 inch side and end laps. Apply each sheet directly behind the cold adhesive applicator. Stagger end laps of the finish ply a minimum 3 feet. Cut a dog ear angle at the end laps on overlapping selvage edges. Using a clean trowel, apply top pressure to top seal T-laps immediately following sheet application. Stagger side laps of the finish ply a minimum 12 inches from side laps in the underlying base ply. Stagger end laps of the finish ply a minimum 3 feet from end laps in the underlying base ply.
4. Heat weld all side and end laps of the modified bitumen plies during each day's application in areas where standing water accumulates.

5. Maximum sheet lengths and special fastening of the specified roof membrane system may be required at various slope increments where the roof deck slope exceeds 1/2 inch per foot. The manufacturer shall provide acceptable sheet lengths and the required fastening schedule for all roofing sheet applications to applicable roof slopes.

F. Granule Embedment: Broadcast mineral granules over all bitumen overruns on the finish ply surface, while the bitumen is still hot or the adhesive is soft, to ensure a monolithic surface color.

G. Flashing Application: Cut the cant backing sheet into 12 inch widths and peel the release film from the back of the sheet. Set the sheet into place over the primed substrate extending 6 inches onto the field of the roof area and 6 inches up the vertical surface utilizing minimum 3 inch laps. Set the non-combustible cant into place dry prior to installation of the roof membrane base ply. Flash walls and curbs using the reinforcing sheet and the metal foil flashing membrane. After the base ply has been applied to the top of the cant, prime the base ply surfaces to receive the reinforcing sheet. Fully adhere the reinforcing sheet, utilizing minimum 3 inch side laps onto the primed base ply surface and up the primed wall or curb to the desired flashing height. After the final roofing ply has been applied to the top of the cant, prepare the surface area that is to receive flashing coverage by torch heating granular surfaces or by application of asphalt primer; allowing primer to dry thoroughly. Torch apply the metal foil-faced flashing into place using three foot widths (cut off the end of roll) always lapping the factory selvage edge. Stagger the laps of the metal foil flashing layer from lap seams in the reinforcing layer. Extend the flashing sheet a minimum of 4 inches beyond the toe of the cant onto the prepared surface of the finished roof and up the wall or curb to the desired flashing height. Exert pressure on the flashing sheet during application to ensure complete contact with the vertical/horizontal surfaces, preventing air pockets; this can be accomplished by using a damp sponge or shop rag. Check and seal all loose laps and edges. Nail the top edge of the flashing on 9 inch centers. (See manufacturer's schematic for visual interpretation).

H. Catalyzed Acrylic Resin Flashing System: Install the liquid-applied primer and flashing system in accordance with the membrane system manufacturer's printed installer's guidelines and other applicable written recommendations as provided by the manufacturer.

I. Water Cut-Off: At end of day's work, or when precipitation is imminent, construct a water cut-off at all open edges. Cut-offs can be built using asphalt or plastic cement and roofing felts, constructed to withstand protracted periods of service. Cut-offs must be completely removed prior to the resumption of roofing.

3.04 ROOF SYSTEM INTERFACE WITH RELATED COMPONENTS

A. Walktread: Cut the walktread into maximum 5 foot lengths and allow to relax until flat. Adhere the sheet using the specified plastic cement. Apply the specified cement in a 3/8 inch thickness to the back of the product in 5 inch by 5 inch spots in accordance with the pattern as supplied by the walktread manufacturer. Walk-in each sheet after application to ensure proper adhesion. Use a minimum spacing of 2 inches between sheets to allow for proper drainage.

B. Sealant: Apply a smooth continuous bead of the specified sealant at the exposed finish ply edge transition to metal flashings incorporated into the roof system.

3.05 FIELD QUALITY CONTROL AND INSPECTIONS

A. Site Condition: Leave all areas around job site free of debris, roofing materials, equipment and related items after completion of job.

B. Notification Of Completion: Notify the manufacturer by means of manufacturer's printed Notification of Completion form of job completion in order to schedule a final inspection date.

C. Post-Installation Meeting: Hold a meeting at the completion of the project, attended by all parties that were present at the pre-job conference. A punch list of items required for completion shall be compiled by the Contractor and the manufacturer's representative. Complete, sign, and mail the punch list form to the manufacturer's headquarters.

D. Issuance Of The Guarantee: Complete all post installation procedures and meet the manufacturer's final endorsement for issuance of the specified guarantee.

END OF SECTION

SECTION 07 54 19
PVC THERMOPLASTIC SINGLE-PLY ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Adhered system with PVC thermoplastic roofing membrane.

B. Insulation, flat and tapered.

C. Protective insulation, flat.

D. Flashings.

E. Roofing cant strips, stack boots, roofing expansion joints, and walkway pads.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood nailers and curbs.

B. Section 07 6200 - Sheet Metal Flashing and Trim: Counterflashings, reglets.

1.03 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.

B. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2014.

C. ASTM D4434/D4434M - Standard Specification for Poly(Vinyl Chloride) Sheet Roofing; 2012.

D. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces; 2011.

E. FM DS 1-28 - Wind Design; 2007.

F. NRCA (RM) - The NRCA Roofing Manual; 2017.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.
   1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's written information listed below.
   1. Product data indicating membrane materials, flashing materials, insulation, and fasteners.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements.

C. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with other materials, setting plan for tapered insulation, and contour rib layout.

D. Samples of roofing membrane: Submit two samples 6 x 6 inches in size illustrating membrane roofing.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures, humidity, wind velocity during application, and supplementary instructions given.

G. Manufacturer's Installation Instructions: Indicate membrane seaming precautions, special procedures, and perimeter conditions requiring special attention.

H. Specimen Warranty: For approval.

I. Warranty:
   1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
   2. Submit installer's certification that installation complies with all warranty conditions for the waterproof membrane.

J. Manufacturer's Qualification Statement.

K. Installer's Qualification Statement.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum twenty (20) years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section:
   1. With minimum five (5) years documented experience.
   2. Approved by membrane manufacturer.
   3. Extend manufacturer's labor and materials guarantee.
   4. Extend manufacturer's No Dollar Limit guarantee.

C. Single Source Responsibility: Provide and install products from single source.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.

B. Store products in weather protected environment, clear of ground and moisture.

C. Protect foam insulation from direct exposure to sunlight.

1.08 FIELD CONDITIONS

A. Do not apply roofing membrane during unsuitable weather.

B. Do not apply roofing membrane when ambient temperature is below 40 degrees F or above 95 degrees F.

C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.
   1. Warranty Term: 20 years.
   2. For repair and replacement include costs of both material and labor in warranty.

C. Special Project Warranty: Submit roofing Installer's warranty, signed by Installer, covering work of this section, including all components of membrane roofing system such as roofing membrane, base flashing, expansion joints, roof insulation, fasteners, cover boards, walkway products and other roofing materials, for a period of 5 years.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Basis of Design: Sika, www.usa.sarnafil.sika.com.

B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ROOFING APPLICATIONS

A. PVC Membrane Roofing: One ply membrane, fully adhered, over insulation.

B. Roofing Assembly Performance Requirements and Design Criteria:

1. Wind Uplift:
   a. Designed to withstand wind uplift forces calculated with ASCE 7.
2. Factory Mutual Classification: Class I and windstorm resistance of I-90, in accordance with FM DS 1-28.

C. Acceptable Insulation Types - Constant Thickness Application:
   1. Minimum one layer of polyisocyanurate board.

D. Acceptable Insulation Types - Tapered Application:
   1. Tapered polyisocyanurate board.

2.03 ROOFING MEMBRANE AND ASSOCIATED MATERIALS

A. Membrane:
   1. Material: Polyvinyl chloride (PVC) complying with ASTM D4434/D4434M.
   2. Thickness: 80 mils (0.080 inch), minimum.
   3. Sheet Width: Factory fabricated into largest sheets possible.
   4. Color: To be selected by Architect from manufacturer's full color range.
   5. Product:
      a. Sika Sarnafil, PVC membrane, fiberglass scrim reinforcement, with lacquer coating and factory applied 9 oz felt backing.

B. Seaming Materials: As recommended by membrane manufacturer.

C. Flexible Flashing Material: Same material as membrane.

2.04 INSULATION

A. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, fiber reinforced felt both faces; Grade 2 and with the following characteristics:
   1. Compressive Strength: 20 psi.
   2. Board Size: 48 x 96 inch.
   3. Board Thickness: 3.3 inches, minimum. (R=38.4)
   4. Tapered Board: Slope as indicated, fabricate of fewest layers possible.
   5. Board Edges: Square.
   6. Product: Equal to Sarnafil Sarnatherm ISO.

B. Polyisocyanurate Board Insulation (Protective Layer): High-density polyisocyanurate insulation bonded in-line to mineral-surfaced, fiber glass reinforced facers.
   1. Compressive Strength: 150 psi, minimum.
   2. Board Size: 48 x 48 inch.
   3. Board Thickness: 1/2 inch, minimum (R=2.5)
   4. Board Edges: Square.
   5. Product: Equal to Sarnafil Sarnatherm HD.

2.05 ACCESSORIES

A. Prefabricated Flashing Accessories:
   1. Corners and Seams: Same material as membrane, in manufacturer's standard thicknesses.
   2. Penetrations: Same material as membrane, with manufacturer's standard cut-outs, rigid inserts, clamping rings, and flanges.
   3. Walkway Rolls: Sarnatred-V Heat Welded Rolled Out Thermoplastic Walkway. Light Gray.
   4. Miscellaneous Flashing: Non-reinforced PVC membrane; 80 mils (0.080 inch) thick, in manufacturer's standard lengths and widths.

B. Membrane Adhesive: As recommended by membrane manufacturer.

C. Expansion Joint Cover Foam Rod Tubing: As recommended by membrane manufacturer.

D. Surface Conditioner for Adhesives: Compatible with membrane and adhesives.

E. Sealants: As recommended by membrane manufacturer.

F. Cleaner: Manufacturer's standard, clear, solvent-based cleaner.

G. Edgings and Terminations: Manufacturer's standard edge and termination accessories.
   1. PVC Coated Sheet Metal.
   2. Termination Bar.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify deck is supported and secure.

C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.

D. Verify deck surfaces are dry and free of snow or ice.

E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.02 PREPARATION, GENERAL

A. Clean substrate thoroughly prior to roof application.

B. Do not begin work until other work that requires foot or equipment traffic on roof is complete.

3.03 INSTALLATION - GENERAL

A. Perform work in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

B. Do not apply roofing membrane during unsuitable weather.

C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.

D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

3.04 INSULATION APPLICATION

A. Coordinate installation of roof system components so insulation and cover board is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with roofing system manufacturer's written instructions for installation of roof insulation and cover board.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install insulation boards with long joints in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with like material.

E. Install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

F. Trim surface of insulation boards where necessary at roof drains so completed surface is flush and does not restrict flow of water.

I. Mechanically Fastened Insulation: Install each layer of insulation and cover board to substrate according to manufacturer’s instructions.

J. Install each layer in a two-part urethane adhesive according to roofing system manufacturer’s instruction.

K. Install each layer to resist uplift pressure at corners, perimeter, and field of roof.

L. Proceed with installation only after unsatisfactory conditions have been corrected.

3.05 COVER BOARD APPLICATION

A. Coordinate installing membrane roofing system components so cover board is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system manufacturer's written instructions for installing roof cover board.

C. Install cover board with long joints of cover board in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with cover board.
   1. Cut and fit cover board within 1/4 inch (6 mm) of nailers, projections, and penetrations.

D. Trim surface of cover board where necessary at roof drains so completed surface is flush and does not restrict flow of water.
   1. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

E. Mechanically Fastened Cover Board: Fasten cover board to substrate according to manufacturer’s recommendations.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.06 MEMBRANE APPLICATION

A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.

B. Shingle joints on sloped substrate in direction of drainage.

C. Fully Adhered Application: Apply adhesive to substrate at a rate as recommended by the manufacturer. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.

D. Seam Welding:
   1. Seam Welding: Overlap edges and ends and seal seams by heat welding, minimum 2 inches.
   2. Cover all seams with manufacturer's recommended joint covers.
   3. Probe all seams once welds have thoroughly cooled. (Approximately 30 minutes.)
   4. Repair all deficient seams within the same day.
   5. Seal cut edges of reinforced membrane after seam probe is complete.

E. At intersections with vertical surfaces:
   1. Extend membrane over cant strips and up a minimum of 4 inches onto vertical surfaces.
   2. Fully adhere flexible flashing over membrane and up to nailing strips.

F. Coordinate installation of roof gutters, downspouts, and related flashings.

G. Install walkway pads. Space pad joints to permit drainage. Layout per roof plan drawings.

H. Daily Seal: Install daily seal per manufacturer’s instructions at the end of each work day. Prevent infiltration of water at incomplete flashings, terminations, and at unfinished membrane edges.

3.08 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field quality control and inspection.

B. Require site attendance of roofing and insulation material manufacturers daily during installation of the Work.

3.09 CLEANING

A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

B. Remove bituminous markings from finished surfaces.

C. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.

D. Repair or replace defaced or damaged finishes caused by work of this section.

3.10 PROTECTION

A. Protect installed roofing and flashings from construction operations.

B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 07 55 00
TPO MEMBRANE ROOFING

PART 1 - GENERAL

1.01 SUMMARY

A. Furnish and install elastomeric sheet roofing system, including:
1. Roofing manufacturer's requirements for the specified warranty.
2. Preparation of roofing substrates.
3. Wood nailers for roofing attachment.
4. Insulation.
5. Cover boards.
6. Elastomeric membrane roofing.
7. Flashings.
8. Other roofing-related items specified or indicated on the drawings or otherwise necessary to provide a complete weatherproof roofing system.

1.02 RELATED DOCUMENTS

A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are located in Division 1 of the Specifications.

1.03 REFERENCES

A. Referenced Standards: These standards form part of this specification only to the extent they are referenced as specification requirements.

B. ASTM C 1177/C 1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2004.

C. ASTM C 1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2004.

D. ASTM C 1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer; 2004.

E. ASTM D 638 - Standard Test Method for Tensile Properties of Plastics; 2003.

F. ASTM D 1004 - Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting; 2003.

G. ASTM D 3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2000.

H. ASTM D 6878 - Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing; 2003.

I. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2005.

J. ASTM E 136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2004.

1.04 SUBMITTALS AND SUBSTITUTIONS

A. In accordance with Section 01 3000.

B. Substitutions will not be considered prior to the award of the General Contract.

C. Product Data:
1. Provide membrane manufacturer's printed data sufficient to show that all components of roofing system, including insulation and fasteners, comply with the specified requirements and with the membrane manufacturer's requirements and recommendations for the system type specified; include data for each product used in conjunction with roofing membrane.

D. Samples: Submit samples of each product to be used.

E. Specimen Warranty: Submit prior to starting work.

F. Installer Qualifications: Letter from manufacturer attesting that the roofing installer meets the specified qualifications.

G. Pre-Installation Notice: Copy to show that manufacturer's required Pre Installation Notice (PIN) has been accepted and approved by the manufacturer.

1.05 QUALITY ASSURANCE

A. Pre-Installation Conference: Before start of roofing work, shall hold a meeting to discuss the proper installation of materials and requirements to achieve the warranty.
1. Require attendance with all parties directly influencing the quality of roofing work or affected by the performance of roofing work.
2. Notify Architect well in advance of meeting.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact and legible.

B. Store materials clear of ground and moisture with weather protective covering.

C. Keep combustible materials away from ignition sources.

1.07 WARRANTY

A. Comply with all warranty procedures required by manufacturer, including notifications, scheduling, and inspections.

B. Manufacturer Warranty: Elevate Building Products (Formerly Firestone Building Products) 20 year Red Shield Limited Warranty covering membrane, roof insulation, and membrane accessories.
1. Limit of Liability: No dollar limitation.
2. Scope of Coverage: Repair leaks in the roofing system caused by:
   a. Ordinary wear and tear of the elements.
   b. Manufacturing defect in materials.
   c. Defective workmanship used to install these materials.
   d. Damage due to winds up to 55 mph (88 km/h).
3. Not Covered:
   a. Damage due to winds in excess of 55 mph (88 km/h).
   b. Damage due hurricanes or tornadoes.
   c. Hail.
   d. Intentional damage.

e. Unintentional damage due to normal rooftop inspections, maintenance, or service.

C. General Contractor and Roofing Subcontractor: Required to jointly and separately provide written guarantee that the roofing and flashing will be weathertight and free from defects in materials and workmanship for a period of 2 years from Final Acceptance Date.
1. Leaks and defects include blistering, fishmouths, ridging, splits, open laps, buckles, wrinkles and slippage. Make corrections at Contractor's expense during guarantee period.
2. Roofing inspection and written acceptance by manufacturer, Architect, and Owner will be required. In addition, roofing subcontractor is to schedule a joint inspection by above named parties 60 days prior to expiration of 2 year guarantee and correct defects complying with original specifications.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer: Elevate Building Products (Formerly Firestone Building Products), or approved equal system by
1. GAF
2. Manville
3. Carlisle

2.02 ROOFING SYSTEM DESCRIPTION

ASSEMBLY 1 (TYPICAL)
1. 60 mil TPO Membrane
2. Over 1/4” Dens Deck Prime Cover Board
3. Over Tapered insulation providing for a roof slope of 1/4 inch
4. Over Insulation (R-26 Min.)

ASSEMBLY 2 (AUDITORIUM CONDITION)
1. 60 mil TPO Membrane
2. Over 5/8” Dens Deck Prime Cover Board
3. Over Tapered insulation providing for a roof slope of 1/4 inch
4. Over Insulation (R-26 Min.)
5. Over 5” Roxul insulation
6. Over 5/8” Dens Deck Prime mechanically attached thru top of the high flute and screw not extending beyond the bottom of the low flute.

A. Roofing System Components:
1. Membrane: Thermoplastic olefin (TPO).
2. Thickness: As specified elsewhere.
3. Membrane Attachment: FULLY ADHERED
4. Comply with applicable local building code requirements.
5. Provide assembly having Underwriters Laboratories, Inc. (UL) Class A Fire Hazard Classification.
6. Provide assembly complying with UL Design Criteria for 1-90 wind uplift rating.

B. Insulation:
1. Thickness Shown or as required to achieve R-26 minimum.
2. Base Layer: Polyisocyanurate foam board, non-composite. Elevate Building Products (Formerly Firestone Building Products) 95+ or approved equal.
a. Attachment: Loose laid

C. Insulation Cover Board:
1. Type: Gypsum-based board, Dens Deck Prime.
2. Attachment: Mechanical fastening thru insulation board into steel deck.

D. Mineral Wool Fiber: A panel composed of a mineral wool fiber made from basalt rock and slag. Panels shall be water repellant yet vapor permeable with an approximate melting point of 2150°F. Provide panels having a nominal thickness of 3 inches. Acceptable types are as follows:
1. Toprock DD Plus, by Roxul, Inc.; Milton, ON

2.03 TPO MEMBRANE MATERIALS

A. Membrane: Flexible, heat weldable sheet composed of thermoplastic polyolefin polymer and ethylene propylene rubber; complying with ASTM D 6878, with polyester weft inserted reinforcement and the following additional characteristics:
1. Thickness: 0.060 inch plus/minus 10 percent, with coating thickness over reinforcement of 0.024 inch (0.61 mm) plus/minus 10 percent.
2. Sheet Width: Provide sheets of width necessary to accommodate batten spacing required by manufacturer for project conditions.
3. Puncture Resistance: 265 lbf (1174 N), minimum, when tested in accordance FTM 101C Method 2031.
4. Solar Reflectance: 0.79, minimum, when tested in accordance with ASTM C 1549.
5. Solar Reflectance Index: (SRI) 98 initial, 81 3-year.
6. Color: White.
7. Acceptable Product: ULTRAPLY TPO by Elevate Building Products (Formerly Firestone Building Products).

B. Membrane Adhesive: UltraPly Bonding Adhesive.

B. Membrane Fasteners: Type and size as required by roof membrane manufacturer for roofing system and warranty to be provided; use only fasteners furnished by roof membrane manufacturer.

C. Curb and Parapet Flashing: Same material as membrane, with encapsulated edge which eliminates need for seam sealing the flashing-to-roof splice; precut to 18 inches (457 mm) wide.

D. Formable Flashing: Non-reinforced, flexible, heat weldable sheet, composed of thermoplastic polyolefin polymer and ethylene propylene rubber.
1. Thickness: 0.060 inch plus/minus 10 percent.
2. Tensile Strength: 1550 psi (10.7 MPa), minimum, when tested in accordance with ASTM D 638 after heat aging.
3. Elongation at Break: 650 percent, minimum, when tested in accordance with ASTM D 638 after heat aging.
4. Tearing Strength: 12 lbf (53 N), minimum, when tested in accordance with ASTM D 1004 after heat aging.
5. Color: White.
6. Acceptable Product: ULTRAPLY TPO Flashing by Elevate Building Products (Formerly Firestone Building Products)

E. Tape Flashing: 5-1/2 inch (140 mm) nominal wide TPO membrane laminated to cured rubber polymer seaming tape, overall thickness 0.065 inch (1.6 mm) nominal; TPO QuickSeam Flashing.

F. Pourable Sealer: Two-part polyurethane, two-color for reliable mixing; Pourable Sealer.

G. Seam Plates: Steel with barbs and Galvalume coating; corrosion-resistance complying with FM 4470.

H. Termination Bars: Aluminum bars with integral caulk ledge; 1.3 inches (33 mm) wide by 0.10 inch (2.5 mm) thick.

I. Cut Edge Sealant: Synthetic rubber-based, for use where membrane reinforcement is exposed; UltraPly TPO Cut Edge Sealant.

J. General Purpose Sealant: EPDM-based, one part, white general purpose sealant; UltraPly TPO General Purpose Sealant.

K. Molded Flashing Accessories: Unreinforced TPO membrane pre-molded to suit a variety of flashing details, including pipe boots, inside corners, outside corners, etc.; UltraPly TPO Small and Large Pipe Flashing.

L. Roof Walkway Pads: Non-reinforced TPO walkway pads, 0.130 inch by 30 inches x length shown on drawings with patterned traffic bearing surface; UltraPly TPO Walkway Pads.

2.04 ROOF INSULATION AND COVER BOARDS

A. Polyisocyanurate Board Insulation: Closed cell polyisocyanurate foam with glass reinforced mat laminated to faces, complying with ASTM C 1289 Type II Class 1, with the following additional characteristics:
1. Thickness: As Shown.
2. Size: 48 inches by 96 inches, nominal.
3. Compressive Strength: 20 psi (138 kPa) when tested in accordance with ASTM C 1289.
4. Ozone Depletion Potential: Zero; made without CFC or HCFC blowing agents.
5. Recycled Content: 19 percent post-consumer and 15 percent post-industrial, average.

B. Gypsum-Based Cover Board: Non-combustible, water resistant gypsum core with embedded glass mat facers, complying with ASTM C 1177/C 1177M, and with the following additional characteristics:
1. Size: 48 inches by 96 inches, nominal.
2. Thickness: As shown
3. Surface Water Absorption: 2.5 g, maximum, when tested in accordance with ASTM C 473.
4. Spanning Capability: Recommended by manufacturer
5. Surface Burning Characteristics: Flame spread of 0, smoke developed of 0, when tested in accordance with ASTM E 84.
6. Combustibility: Non-combustible, when tested in accordance with ASTM E 136.
7. Mold Growth Resistance: Zero growth, when tested in accordance with ASTM D 3273 for minimum of 4 weeks.

C. Insulation Fasteners: Type and size as required by roof membrane manufacturer for roofing system and warranty to be provided; use only fasteners furnished by roof membrane manufacturer.

2.05 ACCESSORY MATERIALS

A. Wood Nailers: PS 20 dimension lumber, Structural Grade No. 2 or better Southern Pine, Douglas Fir; or PS 1, APA Exterior Grade plywood; pressure preservative treated in accordance with Section 06 1000.
1. Width: 3-1/2 inches nominal minimum, or as wide as the nailing flange of the roof accessory to be attached to it.
2. Thickness: Same as thickness of roof insulation.

PART 3 - INSTALLATION

3.01 GENERAL

A. Install roofing, insulation, flashings, and accessories in accordance with roofing manufacturer's published instructions and recommendations for the specified roofing system. Where manufacturer provides no instructions or recommendations, follow good roofing practices and industry standards. Comply with federal, state, and local regulations.

B. Obtain all relevant instructions and maintain copies at project site for duration of installation period.

C. Do not start work until Pre-Installation Notice has been submitted to manufacturer as notification that this project requires a manufacturer's warranty.

D. Perform work using competent and properly equipped personnel.

E. Temporary closures, which ensure that moisture does not damage any completed section of the new roofing system, are the responsibility of the applicator. Completion of flashings, terminations, and temporary closures shall be completed as required to provide a watertight condition.

F. Install roofing membrane only when surfaces are clean, dry, smooth and free of snow or ice; do not apply roofing membrane during inclement weather or when ambient conditions will not allow proper application; consult manufacturer for recommended procedures during cold weather. Do not work with sealants and adhesives when material temperature is outside the range of 60 to 80 degrees F (15 to 25 degrees C).

G. Protect adjacent construction, property, vehicles, and persons from damage related to roofing work; repair or restore damage caused by roofing work.
1. Protect from spills and overspray from bitumen, adhesives, sealants and coatings.
2. Particularly protect metal, glass, plastic, and painted surfaces from bitumen, adhesives, and sealants within the range of wind-borne overspray.
3. Protect finished areas of the roofing system from roofing related work traffic and traffic by other trades.

H. Until ready for use, keep materials in their original containers as labeled by the manufacturer.

I. Consult membrane manufacturer's instructions, container labels, and Material Safety Data Sheets (MSDS) for specific safety instructions. Keep all adhesives, sealants, primers and cleaning materials away from all sources of ignition.

3.02 EXAMINATION

A. Examine roof deck to determine that it is sufficiently rigid to support installers and their mechanical equipment and that deflection will not strain or rupture roof components or deform deck.

B. Verify that surfaces and site conditions are ready to receive work. Correct defects in the substrate before commencing with roofing work.

C. Examine roof substrate to verify that it is properly sloped to drains.

D. Verify that the specifications and drawing details are workable and not in conflict with the roofing manufacturer's recommendations and instructions; start of work constitutes acceptable of project conditions and requirements.

3.03 PREPARATION

A. Take appropriate measures to ensure that fumes from adhesive solvents are not drawn into the building through air intakes.

B. Prior to proceeding, prepare roof surface so that it is clean, dry, and smooth, and free of sharp edges, fins, roughened surfaces, loose or foreign materials, oil, grease and other materials that may damage the membrane.

C. Fill all surface voids in the immediate substrate that are greater than 1/4 inch (6 mm) wide with fill material acceptable to membrane manufacturer.

D. Seal, grout, or tape deck joints, where needed, to prevent bitumen seepage into building.

3.04 INSULATION AND COVER BOARD INSTALLATION

A. Install insulation in configuration and with attachment method(s) specified in PART 2, under Roofing System.

B. Install only as much insulation as can be covered with the completed roofing system before the end of the day's work or before the onset of inclement weather.

C. Lay roof insulation in courses parallel to roof edges.

D. Neatly and tightly fit insulation to all penetrations, projections, and nailers, with gaps not greater than 1/4 inch (6 mm). Fill gaps greater than 1/4 inch (6 mm) with acceptable insulation. Do not leave the roofing membrane unsupported over a space greater than 1/4 inch (6 mm).

E. Mechanical Fastening: Using specified fasteners and insulation plates engage fasteners through insulation into deck to depth and in pattern required by Factory Mutual for FM Class specified in PART 2 and membrane manufacturer, whichever is more stringent.

3.05 ELASTOMERIC MEMBRANE INSTALLATION

A. Beginning at low point of roof, place membrane without stretching over substrate and allow to relax at least 30 minutes before attachment or splicing; in colder weather allow for longer relax time.

B. Lay out the membrane pieces so that field and flashing splices are installed to shed water.

C. Install membrane without wrinkles and without gaps or fishmouths in seams; bond and test seams and laps in accordance with membrane manufacturer's instructions and details.

D. Edge Securement: Secure membrane at all locations where membrane terminates or goes through an angle change greater than 2 in 12 inches (1:6) using mechanically fastened reinforced perimeter fastening strips, plates, or metal edging as indicated or as recommended by roofing manufacturer.
   1. Exceptions: Round pipe penetrations less than 18 inches (460 mm) in diameter and square penetrations less than 4 inches (200 mm) square.

3.06 FLASHING AND ACCESSORIES INSTALLATION

A. Install flashings, including laps, splices, joints, bonding, adhesion, and attachment, as required by membrane manufacturer's recommendations and details.

B. Scuppers: Set in sealant and secure to structure; flash as recommended by manufacturer.

C. Roofing Expansion Joints: Install as shown on drawings and as recommended by roofing manufacturer.

D. Flashing at Walls, Curbs, and Other Vertical and Sloped Surfaces: Install weathertight flashing at all walls, curbs, parapets, curbs, skylights, and other vertical and sloped surfaces that the roofing membrane abuts to; extend flashing at least 8 inches (200 mm) high above membrane surface.
   1. Use the longest practical flashing pieces.
   2. Evaluate the substrate and overlay and adjust installation procedure in accordance with membrane manufacturer's recommendations.
   3. Complete the splice between flashing and the main roof sheet with specified splice adhesive before adhering flashing to the vertical surface.
   4. Provide termination directly to the vertical substrate as shown on roof drawings.

E. Roof Drains:
1. Taper insulation around drain to provide smooth transition from roof surface to drain. Use specified pre-manufactured tapered insulation with facer or suitable bonding surface to achieve slope; slope not to exceed manufacturer's recommendations.
2. Position membrane, then cut a hole for roof drain to allow 1/2 to 3/4 inch (12 to 19 mm) of membrane to extend inside clamping ring past drain bolts.
3. Make round holes in membrane to align with clamping bolts; do not cut membrane back to bolt holes.
4. Apply sealant on top of drain bowl where clamping ring seats below the membrane
5. Install roof drain clamping ring and clamping bolts; tighten clamping bolts to achieve constant compression.

F. Flashing at Penetrations: Flash all penetrations passing through the membrane; make flashing seals directly to the penetration.
1. Pipes, Round Supports, and Similar Items: Flash with specified pre-molded pipe flashings wherever practical; otherwise use specified self-curing elastomeric flashing.
2. Pipe Clusters and Unusual Shaped Penetrations: Provide penetration pocket at least 2 inches (50 mm) deep, with at least 1 inch (25 mm) clearance from penetration, sloped to shed water.
3. Structural Steel Tubing: If corner radii are greater than 1/4 inch (6 mm) and longest side of tube does not exceed 12 inches (305 mm), flash as for pipes; otherwise, provide a standard curb with flashing.
4. Flexible and Moving Penetrations: Provide weathertight gooseneck set in sealant and secured to deck, flashed as recommended by manufacturer.
5. High Temperature Surfaces: Where the in-service temperature is, or is expected to be, in excess of 180 degrees F (82 degrees C), protect the elastomeric components from direct contact with the hot surfaces using an intermediate insulated sleeve as flashing substrate as recommended by membrane manufacturer.

3.07 FINISHING AND WALKWAY INSTALLATION

A. Install walkways at access points to the roof, around rooftop equipment that may require maintenance, and where indicated on the drawings.

3.08 FIELD QUALITY CONTROL

A. Inspection by Manufacturer: Provide final inspection of the roofing system by a Technical Representative employed by roofing system manufacturer specifically to inspect installation for warranty purposes (i.e. not a sales person).

B. Perform all corrections necessary for issuance of warranty.

3.09 CLEANING

A. Clean all contaminants generated by roofing work from building and surrounding areas, including bitumen, adhesives, sealants, and coatings.

B. Repair or replace building components and finished surfaces damaged or defaced due to the work of this section; comply with recommendations of manufacturers of components and surfaces.

C. Remove leftover materials, trash, debris, equipment from project site and surrounding areas.

3.10 PROTECTION

A. Where construction traffic must continue over finished roof membrane, provide durable protection and replace or repair damaged roofing to original condition.

END OF SECTION

SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings and counterflashings.

B. Self-adhering membrane flashing.

C. Reglets and accessories.

D. Gutters and downspouts.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

B. Section 06 1000 - Rough Carpentry: Wood nailers.

C. Section 07 4113 – Metal Roof Panels.

D. Section 07 9200 - Joint Sealants.

1.03 REFERENCE STANDARDS

A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels; 2005.

B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2005.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2010.

D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2010.

E. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2007.

F. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2007.

G. ASTM D226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2009.

H. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension; Current edition.

I. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds; 2010.

J. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2003.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Samples: Submit two samples 6 x 6 inch in size illustrating metal finish color.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements and standard details, except as otherwise indicated.

B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with three years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 0.02 inch thick base metal.

B. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 0.02 inch thick base metal, shop pre-coated with PVDF coating.
   1. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
   2. Colors:
      d. Manufacturers standard colors as selected by Architect.

C. Pre-Finished Aluminum: ASTM B209 (ASTM B209M); 0.032 inch thick; plain finish shop pre-coated with fluoropolymer coating.
   1. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system.
   2. Colors:
      a. Manufacturers standard colors as selected by Architect.
      .

D. Stainless Steel: ASTM A666 Type 304, soft temper, 0.015 inch thick; smooth No. 4 finish.

E. Self-Adhering Membrane Flashing: High density, cross laminated polyethylene film coated with a layer of rubberized asphalt adhesive and an embossed slip resistant sheet.
   1. Thickness: 40 mil.
   2. Product: Equal to Grace Ice and Water Shield.

F. Refer to drawings for locations of self-adhering membrane flashing and sheet metal flashing.

2.02 ACCESSORIES

A. Fasteners: Galvanized steel and stainless steel..

B. Underlayment: ASTM D226, organic roofing felt, Type I ("No. 15").

C. Primer: Zinc chromate type.

D. Protective Backing Paint: Zinc molybdate alkyd.

E. Sealant: Specified in Section 07 9200.

F. Plastic Cement: ASTM D4586, Type I.

G. Reglets: Surface and recessed type, galvanized steel.

2.03 GUTTERS AND DOWNSPOUTS

A. Gutters: Manufactured in uniform section lengths, with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch above front edge. Furnish

expansion joints, and expansion-joint covers.
Gutter Style: As shown on the drawings.
Aluminum: 0.040 inch thick.
Gutter Supports: Gutter brackets, Straps with finish matching the gutters.

B. Downspouts: Plain, shape as shown on the drawings with mitered elbows. Furnish wall brackets of same material and finish as downspouts, with anchors.
Formed Aluminum: 0.040 inch
Downspout Straps: 0.040 inch

2.04 FABRICATION

A. Form sections true to shape, accurate in size, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

F. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

2.05 ROOF PENETRATION FLASHING

A. Provide flashing assembly for all roof penetrations, such as vent stacks, piping, equipment supports. Deliver to site in ample time to avoid delays in other work. Installation is specified as part of the membrane roofing work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Install surface mounted reglets true to lines and levels. Seal top of reglets with sealant.

C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION

A. Insert flashings into reglets to form tight fit. Secure in place with wedges. Seal flashings into reglets with sealant.

B. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.

C. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

D. Seal metal joints watertight.

F. Install pre-finished metal flashing matching adjacent material colors noted above and as noted on the drawings. Custom colors to be determined will be selected and located by the Architect.

G. Install self-adhering membrane flashings where noted on the drawings.

END OF SECTION

SECTION 07 71 13

MANUFACTURED ROOF SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured roof specialties.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

B. Section 01 6000 - Product Requirements: Substitution procedures.

C. Section 06 1000 - Rough Carpentry.

G. Section 07 9200 - Joint Sealants.

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2005.

B. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2009.

C. ASTM D4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007.

D. NRCA ML104 - The NRCA Roofing and Waterproofing Manual; National Roofing Contractors Association; Fifth Edition, with interim updates.

E. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2003.

F. SSPC Paint 12: Cold-Applied Asphalt Mastic (Extra Thick Film).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.

C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.

D. Samples: Submit two appropriately sized samples of coping and gravel stop. Match color sample provided by the Architect.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual details.

B. Single Source Responsibility: Furnish each product from one manufacturer, unless otherwise acceptable to Architect.

1.06 DELIVERY, STORAGE AND HANDLING

A. Stack materials to prevent twisting, bending and abrasions and to provide ventilation.

1.07 WARRANTY

A. Manufacturer's standard 20 year warranty guaranteeing that the roof edge system will not blow off, leak or cause membrane failure, in wind conditions up to 110 mph, or the manufacturer shall repair or replace materials to provide a watertight system.

PART 2 PRODUCTS

2.01 MATERIALS

A. Galvanized Steel: Structural quality, ASTM A653, with galvanized G90 coating.

B. Aluminum: ASTM B209: Aluminum and Aluminum Alloy Sheet and Plate.

C. Preservative Treated Wood: Softwood lumber treated in accordance with AWPA C2 for above grade use.

D. Bituminous Paint: SSPC Paint 12.

E. Roofing Cement: ASTM D 4586, Type I.

B. Gravel Stops: Provide with metal water dam, continuous clamp mechanically fastened to be secured and engaged against roofing membrane.
   1. Dam and Fascia: 0.063 thick aluminum; profile as indicated on the drawings..
   2. Provide splice plates to conceal and weatherseal joints between sections of dam and fascia.
   3. Cleats: Continuous 24 ga., galvanized.

2.02 ACCESSORIES

A. Roof Cement: ASTM D4586, Type I.

B. Provide fasteners, clamping devices, splice strips, adhesives and sealants required by system for proper performance and as recommended by manufacturer.

2.03 FINISHES

A. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; custom color to match approved sample.
   1. Colors to Match Adjacent Materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.

B. Gravel Guard and Coping:
   1. Verify that coverage onto vertical finish materials is sufficient to result in a watertight installation.
   2. Verify membrane terminations and base flashings.

3.02 INSTALLATION

A. General:
   1. Install components in accordance with manufacturer's instructions.
   2. Install units plumb, level, square and free from warp or twist while maintaining dimensional

tolerances and alignment with surrounding construction.

3. Conform to SMACNA Architectural Sheet Metal Manual drawing details.
4. Coordinate installation of components of this section with installation of roofing membrane and base flashings.
5. Coordinate installation of sealants and roofing cement with work of this section to ensure water tightness.
6. Apply bituminous paint on metal surfaces of units in contact with cementitious materials and dissimilar metals.
7. Coordinate with installation of roofing system and related flashing.
8. Coordinate installation of flashing flanges into reglets.

3.03 CLEANING

A. Clean as recommended by product manufacturers. Do not use materials or methods which may damage finish or surrounding construction.

B. Clean primer, adhesive, flashing cements and other products from exposed surfaces, exposed sheet metal and bellows.

END OF SECTION

SECTION 07 84 00

FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of all joints and penetrations in fire-resistance rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

B. Section 01 6000 - Product Requirements: Substitution procedures.

C. Section 07 8116 - Cementitious Fireproofing.

D. Section 07 8123 - Intumescent Fireproofing.

E. Section 09 2600 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.03 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2011a.

B. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.

C. FM 4991 - Approval of Firestop Contractors; Factory Mutual Research Corporation; 2001.

D. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.

E. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations for each type of through-wall penetration product.

D. Shop Drawing: For each through-wall penetration firestop system, show each kind of construction condition penetrated, relationships to adjoining construction and kind of penetrating item. Include firestop design designation of testing and inspecting agency acceptable to authorities having jurisdiction that evidences compliance with requirements for each condition indicated.

E. Where Project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire- protection engineer.

F. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

G. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

H. Certificate from authority having jurisdiction indicating approval of materials used.

I. Qualification statements for installing mechanics.

1.05 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
   1. Listing in the current-year classification or certification books of UL, FM, or ITS (Warnock Hersey) will be considered as constituting an acceptable test report.
   2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.
   3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section and:
   1. Approved by Factory Mutual Research under FM Standard 4991, Approval of Firestop Contractors, UL Qualified Firestopping Contractors Program and meeting any the following requirements:
   2. With minimum 3 years documented experience installing work of this type.
   3. Able to show at least 5 satisfactorily completed projects of comparable size and type.
   4. Licensed by authority having jurisdiction.

D. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, from a single manufacturer.

1.06 PERFORMANCE REQUIREMENTS

A. General: For the following constructions, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly penetrated.
   1. Fire-resistance-rated non-load-bearing walls, including partitions, with fire-protection rated openings.

B. F-Rated Systems: Provide through-penetration firestop systems with F-ratings, as determined per ASTM E 814, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.

C. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings, as well as F-ratings, as determined per ASTM E 814, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
   1. Penetrations located outside wall cavities.
   2. Penetrations located outside fire-resistive shaft enclosures.
   3. Penetrations located in construction containing fire-protection-rated openings.
   4. Penetrating items larger than 4-inch diameter nominal pipe or 16 sq. in. in overall cross-sectional area.

D. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that after curing do not deteriorate when exposed to these conditions both during and after construction.
   1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture resistant through-penetration firestop systems.
   2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved either by installing floor plates or by other means.
   3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

E. For through-penetration firestop systems exposed to view, provide products with flame spread

ratings of less than 25 and smoke-developed ratings of less than 450, as determined per ASTM E 84.

F. Fire rated wiring devices shall bear the UL Classification marking and shall be tested in accordance with ASTM E81.

1.07 MOCK-UP

A. Install one firestopping assembly representative of each fire rating design required on project.
   1. Where one design may be used for different penetrating items or in different wall constructions, install one assembly for each different combination.
   2. Where firestopping is intended to fill a linear opening, install minimum of 1 linear ft.

B. Obtain approval of authority having jurisdiction before proceeding.

C. If accepted, mock-up will represent minimum standard for the Work.

D. If accepted, mock-up may remain as part of the Work. Remove and replace mock-ups not accepted.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturer's labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multi-component materials.

B. Store and handle firestopping materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.09 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation. Maintain minimum temperature before, during, and for 3 days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.

1.10 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that through penetration firestop systems are installed according to specified requirements. Accommodate through-penetration firestop systems.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

C. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until building inspector, if required by authorities having jurisdiction, has examined each installation.

PART 2 PRODUCTS

2.01 FIRESTOPPING - GENERAL REQUIREMENTS

A. Manufacturers:
   1. A/D Fire Protection Systems Inc: www.adfire.com.
   2. 3M Fire Protection Products: www.3m.com/firestop.
   3. Hilti, Inc: www.us.hilti.com.
   4. Nelson FireStop Products: www.nelsonfirestop.com.
   5. Specified Technologies, Inc: www.stifirestop.com.
   6. Substitutions: See Section 01600 - Product Requirements.

B. Firestopping: Any material meeting requirements.

C. Materials: Use any material meeting requirements.

D. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.

E. Fire Ratings: See Drawings for required ratings.

F. Firestop Identification Labels: Label each firestopping system with the appropriate UL system number and product manufacturer number.

2.02 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Perimeter Fire Containment Firestopping: Use any system, packing and spray, that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of the floor assembly.

B. Head-of-Wall Firestopping at Joints Between Non-Rated Floor and Fire-Rated Wall: Use any system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of floor or wall, whichever is greater.

C. Floor-to-Floor, Wall-to-Wall, and Wall-to-Floor Joints, Except Perimeter, Where Both Are Fire-Rated: Use any system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
   1. Listing by UL, FM, or Intertek in their certification directory will be considered evidence of successful testing.

D. Through Penetration Firestopping: Use any system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
   1. Listing by UL, FM, or Intertek in their certification directory will be considered evidence of successful testing.

2.03 FIRESTOPPING FOR FLOOR-TO-FLOOR, WALL-TO-FLOOR, AND WALL-TO-WALL JOINTS

A. Concrete and Concrete Masonry Walls and Floors:
   1. Floor to Floor Joints:
      a. 2 Hour Construction: UL System FF-D-1013; Hilti CFS-SP WB Firestop Joint Spray and CP 672.
   2. Top of Wall Joints at Concrete/Concrete Masonry Wall to Concrete Over Metal Deck Floor:
      a. 2 Hour Construction: UL System HW-D-0181; Hilti CFS-SP WB Firestop Joint Spray and CP 672.
      b. 2 Hour Construction: UL System HW-D-1037; Hilti CFS-SP WB Firestop Joint Spray and CP 672.
   3. Top of Wall Joints at Concrete/Concrete Masonry Wall to Concrete Floor:
      a. 3 Hour Construction: UL System HW-D-1058; Hilti CFS-SP WB Firestop Joint Spray and CP 672.
      b. 2 Hour Construction: UL System HW-D-0268; Hilti CP 606 Flexible Firestop Sealant.
   4. Concrete/Concrete Masonry Wall to Wall Joints:
      a. 2 Hour Construction: UL System WW-D-0017; Hilti CFS-SP WB Firestop Joint Spray and CP 672.
      b. 2 Hour Construction: UL System WW-D-0032; Hilti CP 606 Flexible Firestop Sealant.

B. Gypsum Board Walls:
   1. Wall to Wall Joints:
      a. 2 Hour Construction: UL System WW-D-0067; Hilti CP 606 Flexible Firestop Sealant.
      b. 1 Hour Construction: UL System WW-D-0067; Hilti CP 606 Flexible Firestop Sealant.
   2. Top of Wall Joints at Underside of Steel Beam and Concrete Over Metal Deck Floor with Sprayed On Fireproofing:
      a. 2 Hour Construction: UL System HW-D-0259; Hilti CFS-SP WB Firestop Joint Spray

and CP 672.
b. 1 Hour Construction: UL System HW-D-0259; Hilti CFS-SP WB Firestop Joint Spray and CP 672.

3. Top of Wall Joints at Underside of Flat Concrete:
   a. 2 Hour Construction: UL System HW-D-1068; Hilti CFS-SP WB Firestop Joint Spray and CP 672.
   b. 1 Hour Construction: UL System HW-D-1068; Hilti CFS-SP WB Firestop Joint Spray and CP 672.
4. Top of Wall Joints at Concrete Over Metal Deck, Wall Parallel to Ribs:
   a. 2 Hour Construction: UL System HW-D-0049; Hilti CFS-SP WB Firestop Joint Spray and CP 672.
   b. 2 Hour Construction: UL System HW-D-0184; Hilti CP 606 Flexible Firestop Sealant.
   c. 1 Hour Construction: UL System HW-D-0049; Hilti CFS-SP WB Firestop Joint Spray and CP 672.
   d. 1 Hour Construction: UL System HW-D-0184; Hilti CP 606 Flexible Firestop Sealant.
5. Top of Wall Joints at Concrete Over Metal Deck, Wall Perpendicular to Ribs, Cut to Fit Ribs:
   a. 2 Hour Construction: UL System HW-D-0045; Hilti CP 606 Flexible Firestop Sealant.
6. Top of Wall Joints at Concrete Over Metal Deck, Wall Perpendicular to Ribs, Not Cut to Fit:
   a. 2 Hour Construction: UL System HW-D-0042; Hilti CFS-SP WB Firestop Joint Spray and CP 672.
   b. 2 Hour Construction: UL System HW-D-0045; Hilti CP 606 Flexible Firestop Sealant.
   c. 1 Hour Construction: UL System HW-D-0042; Hilti CFS-SP WB Firestop Joint Spray and CP 672.
   d. 1 Hour Construction: UL System HW-D-0045; Hilti CP 606 Flexible Firestop Sealant.

2.04 FIRESTOPPING PENETRATIONS THROUGH CONCRETE AND CONCRETE MASONRY CONSTRUCTION

A. Blank Openings:
   1. In Floors or Walls:
      a. 2 Hour Construction: UL System C-AJ-0090; Hilti FS-ONE Intumescent Firestop Sealant.

B. Penetrations Through Floors or Walls By:
   1. Multiple Penetrations in Large Openings:
      a. 3 Hour Construction: UL System C-AJ-1140; Hilti CP 637 Firestop Mortar.
      b. 3 Hour Construction: UL System C-AJ-8110; Hilti FS 657 Fire Block.
      c. 2 Hour Construction: UL System C-AJ-8143; Hilti FS-ONE Intumescent Firestop Sealant.
   2. Uninsulated Metallic Pipe, Conduit, and Tubing:
      a. 3 Hour Construction: UL System C-AJ-1184; Hilti FS-ONE Intumescent Firestop Sealant.
      b. 3 Hour Construction: UL System C-AJ-1226; Hilti FS-ONE Intumescent Firestop Sealant.
      c. 3 Hour Construction: UL System C-AJ-1421; Hilti FS-ONE Intumescent Firestop Sealant or CP 604 Self-Leveling Firestop Sealant.
      d. 3 Hour Construction: UL System C-AJ-1425; Hilti CP 604 Self-Leveling Firestop Sealant.
      e. 2 Hour Construction: UL System C-AJ-1421; Hilti FS-ONE Intumescent Firestop Sealant or CP 604 Self-Leveling Firestop Sealant.
      f. 2 Hour Construction: UL System C-AJ-1498; Hilti CP 680-P/M Cast-In Device.
   3. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
      a. 3 Hour Construction: UL System C-AJ-2109; Hilti CP 643N/644 Firestop Collar.
      b. 3 Hour Construction: UL System C-AJ-2336; Hilti CP 648-E Firestop Wrap Strip with

Retaining Collar.
c. 3 Hour Construction: UL System C-AJ-2342; Hilti CP-E/S Firestop Wrap Strip.
d. 2 Hour Construction: UL System C-AJ-2567; Hilti FS-ONE Intumescent Firestop Sealant.
e. 2 Hour Construction: UL System C-AJ-2109; Hilti CP 643N/644 Firestop Collar.
f. 2 Hour Construction: UL System C-BJ-2021; Hilti CP 643N Firestop Collar.

4. Electrical Cables Not In Conduit:
   a. 3 Hour Construction: UL System C-AJ-3095; Hilti FS-ONE Intumescent Firestop Sealant.
   b. 3 Hour Construction: UL System C-AJ-3180; Hilti FS-ONE Intumescent Firestop Sealant.
   c. 3 Hour Construction: UL System C-AJ-3181; Hilti CP 606 Flexible Firestop Sealant.
   d. 3 Hour Construction: UL System C-AJ-3208; Hilti CP 618 Firestop Putty Stick.
   e. 2 Hour Construction: UL System C-AJ-3216; Hilti CP 658 Firestop Plug.
5. Cable Trays with Electrical Cables:
   a. 3 Hour Construction: UL System C-AJ-4035; Hilti FS-ONE Intumescent Firestop Sealant.
   b. 2 Hour Construction: UL System C-AJ-4071; Hilti FS 657 Fire Block.
6. Electrical Busways:
   a. 3 Hour Construction: UL System C-AJ-6017; Hilti FS-ONE Intumescent Firestop Sealant.
7. Insulated Pipes:
   a. 3 Hour Construction: UL System C-AJ-5090; Hilti FS-ONE Intumescent Firestop Sealant.
   b. 2 Hour Construction: UL System C-AJ-5091; Hilti FS-ONE Intumescent Firestop Sealant.
   c. 2 Hour Construction: UL System C-AJ-5048; Hilti FS-ONE Intumescent Firestop Sealant, CP 606 Flexible Firestop Sealant, CP 601S Elastomeric Firestop Sealant, or CP 604 Self-Leveling Firestop Sealant.
8. HVAC Ducts, Uninsulated:
   a. 2 Hour Construction: UL System C-AJ-7111; Hilti FS-ONE Intumescent Firestop Sealant.
   b. 2 Hour Construction: UL System C-AJ-7084; Hilti FS-ONE Intumescent Firestop Sealant, CP 606 Flexible Firestop Sealant, CP 601S Elastomeric Firestop Sealant, or CP 604 Self-Leveling Firestop Sealant.

C. Penetrations Through Floors By:
1. Multiple Penetrations in Large Openings:
   a. 3 Hour Construction: UL System F-A-1023; Hilti CP 680-P/M Cast-In Device.
   b. 2 Hour Construction: UL System F-A-8012; Hilti CP 604 Self-Leveling Firestop Sealant.
2. Uninsulated Metallic Pipe, Conduit, and Tubing:
   a. 2 Hour Construction: UL System F-A-1016; Hilti CP 680-P/M Cast-In Device.
3. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
   a. 2 Hour Construction: UL System F-A-2015; Hilti CP 643N Firestop Collar.
   b. 2 Hour Construction: UL System F-A-2053; Hilti CP 680-P Cast-In Device.
   c. 2 Hour Construction: UL System F-A-2058; HIlti FS-ONE Intumescent Firestop Sealant.
4. Electrical Cables Not In Conduit:
   a. 2 Hour Construction: UL System F-A-3033; Hilti CP 680-P/M Cast-In Device.
5. Electrical Busways:
   a. 2 Hour Construction: UL System F-A-6002; Hilti CP 604 Self-Leveling Firestop Sealant.
6. Insulated Pipes:
   a. 2 Hour Construction: UL System F-A-5015; Hilti CP 680-P/M Cast-In Device.

b. 2 Hour Construction: UL System F-A-5017; Hilti CP 680-P/M Cast-In Device.

D. Penetrations Through Walls By:
1. Uninsulated Metallic Pipe, Conduit, and Tubing:
a. 2 Hour Construction: UL System W-J-1067; Hilti FS-ONE Intumescent Firestop Sealant.
b. 1 Hour Construction: UL System W-J-1067; Hilti FS-ONE Intumescent Firestop Sealant.
2. Electrical Cables Not In Conduit:
a. 2 Hour Construction: UL System W-J-3060; Hilti FS-ONE Intumescent Firestop Sealant, CP 606 Flexible Firestop Sealant, CD 601S Elastomeric Firestop Sealant, or CP 618 Firestop Putty Stick.
b. 2 Hour Construction: UL System W-J-3143; Hilti CP 658T Firestop Plug.
3. Insulated Pipes:
a. 2 Hour Construction: UL System W-J-5041; Hilti FS-ONE Intumescent Firestop Sealant.
b. 2 Hour Construction: UL System W-J-5042; Hilti FS-ONE Intumescent Firestop Sealant.
c. 2 Hour Construction: UL System W-J-5028; Hilti FS-ONE Intumescent Firestop Sealant.
d. 1 Hour Construction: UL System W-J-5041; Hilti FS-ONE Intumescent Firestop Sealant.
e. 1 Hour Construction: UL System W-J-5042; Hilti FS-ONE Intumescent Firestop Sealant.
f. 1 Hour Construction: UL System W-J-5028; Hilti FS-ONE Intumescent Firestop Sealant.
4. HVAC Ducts, Uninsulated:
a. 2 Hour Construction: UL System W-J-7109; Hilti FS-ONE Intumescent Firestop Sealant or CP 606 Flexible Firestop Sealant.
5. HVAC Ducts, Insulated:
a. 2 Hour Construction: UL System W-J-7112; Hilti FS-ONE Intumescent Firestop Sealant.

2.05 FIRESTOPPING PENETRATIONS THROUGH GYPSUM BOARD WALLS

A. Blank Openings:
1. 2 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.
2. 1 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.

B. Penetrations By:
1. Multiple Penetrations in Large Openings:
a. 2 Hour Construction: UL System W-L-1389; Hilti FS-ONE Intumescent Firestop Sealant.
b. 2 Hour Construction: UL System W-L-1408; Hilti FS-ONE Intumescent Firestop Sealant.
c. 2 Hour Construction: UL System W-L-8071; Hilti FS-ONE Intumescent Firestop Sealant.
d. 2 Hour Construction: UL System W-L-8079; Hilti FS-ONE Intumescent Firestop Sealant.
e. 2 Hour Construction: UL System W-L-8087; Hilti FS 657 Fire Block.
f. 1 Hour Construction: UL System W-L-1389; Hilti FS-ONE Intumescent Firestop Sealant.
g. 1 Hour Construction: UL System W-L-1408; Hilti FS-ONE Intumescent Firestop Sealant.
h. 1 Hour Construction: UL System W-L-8071; Hilti FS-ONE Intumescent Firestop Sealant.

i. 1 Hour Construction: UL System W-L-8079; Hilti FS-ONE Intumescent Firestop Sealant.
j. 1 Hour Construction: UL System W-L-8087; Hilti FS 657 Fire Block.

2. Uninsulated Metallic Pipe, Conduit, and Tubing:
   a. 2 Hour Construction: UL System W-L-1054; Hilti FS-ONE Intumescent Firestop Sealant.
   b. 2 Hour Construction: UL System W-L-1164; Hilti FS-ONE Intumescent Firestop Sealant.
   c. 2 Hour Construction: UL System W-L-1206; Hilti FS-ONE Intumescent Firestop Sealant.
   d. 1 Hour Construction: UL System W-L-1054; Hilti FS-ONE Intumescent Firestop Sealant.
   e. 1 Hour Construction: UL System W-L-1164; Hilti FS-ONE Intumescent Firestop Sealant.
   f. 1 Hour Construction: UL System W-L-1206; Hilti FS-ONE Intumescent Firestop Sealant.
3. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
   a. 2 Hour Construction: UL System W-L-2078; Hilti CP 643N/644 Firestop Collar.
   b. 2 Hour Construction: UL System W-L-2411; Hilti CP 648-E Firestop Wrap Strip.
   c. 2 Hour Construction: UL System W-L-2128; Hilti FS-ONE Intumescent Firestop Sealant.
   d. 1 Hour Construction: UL System W-L-2078; Hilti CP 643N/644 Firestop Collar.
   e. 1 Hour Construction: UL System W-L-2411; Hilti CP 648-E Firestop Wrap Strip.
   f. 1 Hour Construction: UL System W-L-2128; Hilti FS-ONE Intumescent Firestop Sealant.
4. Electrical Cables Not In Conduit:
   a. 2 Hour Construction: UL System W-L-3065; Hilti FS-ONE Intumescent Firestop Sealant, CP 606 Flexible Firestop Sealant, CD 601S Elastomeric Firestop Sealant, or CP 618 Firestop Putty Stick.
   b. 2 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.
   c. 1 Hour Construction: UL System W-L-3065; Hilti FS-ONE Intumescent Firestop Sealant, CP 606 Flexible Firestop Sealant, CD 601S Elastomeric Firestop Sealant, or CP 618 Firestop Putty Stick.
   d. 1 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.
5. Cable Trays with Electrical Cables:
   a. 2 Hour Construction: UL System W-L-4011; Hilti FS 657 Fire Block.
   b. 2 Hour Construction: UL System W-L-4060; Hilti FS-ONE Intumescent Firestop Sealant.
   c. 1 Hour Construction: UL System W-L-4011; Hilti FS 657 Fire Block.
   d. 1 Hour Construction: UL System W-L-4060; Hilti FS-ONE Intumescent Firestop Sealant.
6. Insulated Pipes:
   a. 2 Hour Construction: UL System W-L-5028; Hilti FS-ONE Intumescent Firestop Sealant.
   b. 2 Hour Construction: UL System W-L-5029; Hilti FS-ONE Intumescent Firestop Sealant.
   c. 2 Hour Construction: UL System W-L-5096; Hilti FS-ONE Intumescent Firestop Sealant.
   d. 2 Hour Construction: UL System W-L-5257; Hilti FS-ONE Intumescent Firestop Sealant, CP 606 Flexible Firestop Sealant, or CP 601S Elastomeric Firestop Sealant.
   e. 2 Hour Construction: UL System W-L-5244; Hilti CP 648-E Firestop Wrap Strip.
   f. 1 Hour Construction: UL System W-L-5028; Hilti FS-ONE Intumescent Firestop Sealant.
   g. 1 Hour Construction: UL System W-L-5029; Hilti FS-ONE Intumescent Firestop Sealant.

h. 1 Hour Construction: UL System W-L-5096; Hilti FS-ONE Intumescent Firestop Sealant.
i. 1 Hour Construction: UL System W-L-5096; Hilti FS-ONE Intumescent Firestop Sealant, CP 606 Flexible Firestop Sealant, or CP 601S Elastomeric Firestop Sealant.

7. HVAC Ducts, Insulated:
   a. 2 Hour Construction: UL System W-L-7156; Hilti FS-ONE Intumescent Firestop Sealant.
   b. 1 Hour Construction: UL System W-L-7156; Hilti FS-ONE Intumescent Firestop Sealant.

2.06 CURTAIN WALL JOINTS

A. Concrete Floor to glass, aluminum, or granite spandrel panel with aluminum framing:
   1. Floor to Curtain Wall Joints:
      a. 2 Hour Construction: UL System CW-D-2027; Hilti CP 672 Firestop Joint Spray, CFS-SP SIL Firestop Silicone Joint Spray or CFS-SP WB Firestop Joint Spray.

2.06 FIRESTOPPING SYSTEMS

A. Firestopping: Provide materials that are compatible with adjacent construction.
   1. Fire Ratings: Use any system listed by UL, FM, or ITS (Warnock Hersey) or tested in accordance with ASTM E 814 or ASTM E 119 that has F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and that meets all other specified requirements.
   2. Provide asbestos free materials that comply with applicable codes.
   3. See Systems and Application Schedule for fire stopping to be used at wall and floor construction types listed. Where any of the listed systems have been revised so as not to match construction or the system is no longer available, the Contractor is to provide an alternate system listed by UL, FM or ITS (Warnock Hersey) that has a matching F Rating for the penetrated assembly.
   4. Provide sleeves, collars, sealants and any other accessory required for a complete installation.

B. Manufacturers:
   1. AID Fire Protection Systems, Inc..;
   2. Grace Construction Products;
   3. HILTI, Inc.;
   4. Johns Manville International, Inc.;
   5. Nelson Firestop Products;
   6. Pecora Corp;
   7. 3M Fire Protection Products;
   8. Specified Technologies, Inc;
   9. United States Gypsum Company;
   10. Substitutions: See Section 01600 - Product Requirements.

C. Firestopping: Any material meeting requirements.
   1. Fire Ratings: Use any system listed by UL or tested in accordance with ASTM E814 that has F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and that meets all other specified requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install backing materials to arrest liquid material leakage.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authority having jurisdiction.

C. Install labeling at each firestopped opening and penetration.

3.04 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sealants and joint backing.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

B. Section 01 6000 - Product Requirements: Substitution procedures.

D. Section 04 2731 – Reinforced Unit Masonry.

E. Section 08 8000 - Glazing: Glazing sealants and accessories.

F. Section 09 2116 - Gypsum Board Assemblies: Acoustic sealant.

1.03 REFERENCE STANDARDS

A. ASTM C834 - Standard Specification for Latex Sealants; 2010.

B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2008.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2011.

D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2010.

E. ASTM D1667 - Standard Specification for Flexible Cellular Materials--Poly(Vinyl Chloride) Foam (Closed-Cell); 2005 (Reapproved 2011).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with other sections referencing this section.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating sealant storage requirements, shelf life, curing time, instructions for mixing and application, chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.

C. Submit two copies of joint sealant manufacturer's color chart of full custom and standard color range for all sealants for selection.

D. Samples: Submit the following:
   1. Cured sealants after color selection has been made.
   2. Sealant backing materials, minimum 12 inches long.
   3. Drain tube, minimum 12 inches long.
   4. Sealant bond breaker material.

E. Manufacturer's Installation Instructions: Indicate special procedures, surface preparation, and perimeter conditions requiring special attention.

F. Provide listing of all surfaces that require priming prior to application of sealant. Provide complete description of primer and means of application.

G. Certificates of compliance stating that the materials conform to the specified requirements.

H. Material Safety Data Sheet: Provide copies for each solvent, primer and sealant material.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five years' experience.

B. Applicator Qualifications: Sealant company specializing in performing the work of this section with minimum five years' experience. If requested by Architect, submit evidence of successful experience on projects similar in size and scope to this Work.

1.07 FIELD CONDITIONS

A. Ambient temperature shall be within the limits of 40 to 100 degrees F when the sealants are applied.

B. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.08 WARRANTY

A. See Section 01 7000 – Contract Closeout, for additional warranty requirements.

B. Provide installation warranty against defective materials and workmanship within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealants and accessories which fail to achieve watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

D. During the warranty period restore defective work to the standard of the Contract Documents without additional compensation, including all materials, labor, refinishing and other costs incidental to the work. Within 24 hours after receipt of notice from the Owner, inspect the work and immediately repair leaks. Restore work found to be defective, as defined in the Contract Documents, within 10 days after receipt of notice from the Owner.

1.09 DELIVERY AND STORAGE

A. Materials shall be delivered to the job in the manufacturer's original unopened containers. The container label or accompanying data sheet shall include the following information as applicable: manufacturer, name of material, formula or specification number, lot number, color, date of manufacture, mixing instructions, shelf life, and curing time.

B. Materials shall be handled and stored to prevent inclusion of foreign materials. Materials shall be stored at between 40 and 90 degrees F unless otherwise specified by the manufacturer.

PART 2 PRODUCTS

2.01 SEALANTS

A. General Purpose Exterior Sealant: Silicone; ASTM C920, Type S, Grade NS, Class 50, Uses NT, G, A and O; single component.
   1. Color: To be selected by Architect from manufacturer's standard range.
   2. Product: 795 Silicone Building Sealant manufactured by Dow Corning.
      a. Substitutions: See Section 01 6000 - Product Requirements.
   3. Applications: Use for:
      a. Joints between metal frames and other materials.
      b. Structural and non-structural glazing.
      c. Exterior Insulation and Finish System joints.
      d. Weather sealing of glass, aluminum, painted steel, granite and other stone.
      e. Other exterior joints for which no other sealant is indicated.

B. General Purpose Exterior Sealant: Silicone; ASTM C920, Type S, Grade NS, Class 100/50, Uses T, NT, M, G, A and O; single component.

1. Color: To be selected by Architect from manufacturer's standard range.
2. Product: 790 Silicone Building Sealant manufactured by Dow Corning.
   a. Substitutions: See Section 01 6000 - Product Requirements.
3. Applications: Use for:
   a. Control, expansion and soft joints in masonry.
   b. Precast concrete panel joints.
   c. Prefabricated wall panel system panel joints.
   d. Joints between concrete and other materials.
   e. Curtainwall and mullion joints.
   f. Exterior Insulation and Finish System joints.

C. Exterior Metal Lap Joint Sealant: Butyl or polyisobutylene, nondrying, nonskinning, noncuring.
1. Applications: Use for:
   a. Concealed sealant bead in sheet metal work.
   b. Concealed sealant bead in siding overlaps.
   c. Bedding of thresholds.

D. General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, Type OP, Grade NF single component, paintable.
1. Color: To be selected by Architect from manufacturer's standard range.
2. Applications: Use for:
   a. Interior wall and ceiling control joints.
   b. Joints between door and window frames and wall surfaces.
   c. Interior joints between edge of gypsum board and floor.
   d. Interior joints between edge of gypsum board and structure.
   e. Interior joints between millwork/casework and wall surfaces.
   f. Other interior joints for which no other type of sealant is indicated.

E. Bathtub/Tile Sealant: Silicone; ASTM C920, Uses I, M and A; single component, mildew resistant.
1. Color: To be selected by Architect from manufacturer's standard range.
2. Product: 785 Sanitary Silicone Sealant manufactured by Dow Corning.
   a. Substitutions: See Section 01 6000 - Product Requirements.
3. Applications: Use for:
   a. Joints between plumbing fixtures and floor and wall surfaces.
   b. Joints between kitchen and bath countertops and wall surfaces.

F. Acoustical Sealant for Concealed Locations: Permanently tacky non-hardening butyl sealant. ASTM C 920, Grade NS, Class 12-1/2, Uses M and A, single component, solvent release curing.
1. Applications: Use for concealed locations only:
   a. Sealant bead between top stud runner and structure and between bottom stud track and floor and between gypsum board and vertical surfaces. Two beads of sealant at all locations.
   b. Bedding of electrical boxes and other through wall penetrations in wall systems.

G. Interior Floor Joint Sealant: Polyurethane, self-leveling; ASTM C920, Grade P, Class 25, Uses T, M and A; single component.
1. Approved by manufacturer for wide joints up to 1-1/2 inches.
2. Color: To be selected by Architect from manufacturer's standard range.
3. Applications: Use for:
   a. Expansion joints in floors.

H. Concrete Paving Joint Sealant: Polyurethane, self-leveling; ASTM C920, Class 25, Uses T, I, M and A; single component.
1. Color: Color as selected.

2. Applications: Use for:
   a. Joints in sidewalks and vehicular paving.

I. Silicone Sealant: ASTM C920, Grade NS, Class 25, Uses NT, A, G, M, O; single component, neutral curing, non-sagging, non-staining, fungus resistant, non-bleeding.
   1. Color: To be selected by Architect from manufacturer's standard range.
   2. Applications: Use for:
      a. Control joints in interior masonry.
      b. Joints between masonry non-bearing walls or partitions and underside of floors, beams and slabs.
      c. Joints around pipes, conduits and ducts which penetrate interior walls and partitions.
      d. All penetrations in partitions enclosing patient room suites and isolation rooms must be completely sealed to prevent any unducted transfer of air between adjacent suites and the corridors.
      e. Other joints as indicated.

2.02 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: Round foam rod compatible with sealant; ASTM D 1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

E. Drain Tube: Silicone rubber tubing complying with ASTM C1115, Classification TH3S2. Tube shall have maximum outside diameter of 3/8 inch and minimum inside diameter of 1/4 inch. Color to match adjacent sealant.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean and prime joints in accordance with manufacturer's instructions.

C. Provide primer to all substrates when recommended by manufacturer:
   1. Perform an adhesion test at any questionable substrates.

D. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

E. Masonry, concrete or other porous substrates:

1. Remove loose particles, dirt, paint, foreign matter, and concrete curing compound by sandblasting, nylon bristle brush or other sealant manufacturer approved method not injurious to the substrate material and that will not change the appearance of the exposed surfaces adjacent to the sealant joint opening. Expose fine aggregate of concrete substrates to be sealed. Remove dust created by cleaning by repeated brushing with a soft bristle brush or by blowing dust from the substrate with oil-free compressed air.
2. Clean sealant joint opening of mortar droppings and any other materials that affect finished sealant joint performance prior to installation of sealant backing material.

F. Metal Substrates:
1. Remove oils, residues from forming processes, corrosion and oxide build-up by nylon bristle brush, chemical cleaners or other sealant manufacturer approved method. Following removal, clean the substrate.

G. Coated Metal or Other Non-Porous Substrates:
1. Clean the substrate surface using the two-cloth system with a clean, lint free, white cloth soaked in solvent.
2. Clean organically coated (PVF, silicone-polyester, etc.) panels or other similar factory applied finishes with sealant and finish manufacturer approved solvent that is compatible with organic coating system.

H. Elastomeric Rubber and Other Organic Substrates:
1. Submit organic materials to sealant manufacturer for compatibility testing by ASTM C1087 and adhesion testing by ASTM C794.
2. Remove lubricants, release agents, dusting agents and other materials from the substrate surface, either using cleaning procedures based on the successful completion of the above testing, as provided in writing by the sealant manufacturer.

I. Mortar Joints:
1. Where indicated or specified, rake out mortar joints to width and depth indicated to receive sealant. Bring joints having excessive depth to proper depth with sealant backing specified. Rake out to proper depth joints that are too shallow.

J. Primer:
1. Apply primer, as recommended by the sealant manufacturer, only to previously cleaned substrate surfaces to which sealants will be applied. Prime only those substrate surfaces that can be sealed immediately after the recommended primer curing period.

K. Sealant Backing Material:
1. Install sealant backing, of proper type and size, at proper depth in joint to provide specified joint dimensions. Place sealant backing into the joint to avoid lengthwise stretching, twisting, braiding or lapping. Provide continuity with tight butt joints. Install dry sealant backing immediately prior to installing sealant. Apply sealant with sealant backing in place unless otherwise indicated.

L. Bond Breaker:
1. Install properly sized bond breaker tape so that entire surface is covered. Do not extend bond breaker tape onto the substrate surfaces to interrupt or prevent adhesion of the sealant to the substrate.

M. Drain Tube:
1. Install drain tube at spacing indicated on Drawings, or not greater than 32 inches on center. Tube shall extend from face of sealant 1/4 inch minimum to 3/8 inch maximum and inward a sufficient dimension to extend beyond interior face of sealant backing, which has been interrupted to permit drain tube installation.

N. Joint Dimensions:
   1. Create joint opening depth (as measured at the sealant and substrate interface) for sealant contacting and bonded to substrate surfaces no less than 1/4 inch in depth. Minimum sealant depth at the mid-point of the joint width: 1/8 inch.
   2. Unless indicated otherwise on the Drawings, for joint opening widths from 1/4 inch up to 1/2 inch wide, provide joint opening depth of 1/4 inch; for joint opening widths over 1/2 inch to 3/4 inch wide, provide joint opening depth of one half the width; for joint opening widths over 3/4 inch to 2 inches wide, provide joint opening depth no greater than 3/8 inch; and for joint opening widths exceeding 2 inches, provide depth as determined by the sealant manufacturer.
   3. Refer to Drawings for joint opening requirements.

O. Protect elements surrounding the work of this section from damage or disfigurement.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions as appropriate to substrates and materials being joined.

B. Perform installation in accordance with ASTM C1193.

C. Perform acoustical sealant application work in accordance with ASTM C919.

D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer.

E. Install bond breaker where joint backing is not used.

F. Place masking tape on the finish surface of one or both sides of a joint cavity to protect adjacent finish surfaces from primer and sealant smears. Remove tape within 10 minutes after joint has been filled and tooled.

G. Primer shall be used on concrete masonry units, wood or other porous surfaces in accordance with instructions furnished with the sealant. Primer shall be applied to the joint surfaces to be sealed. Surfaces adjacent to joints shall not be primed.

H. Sealant shall be used before expiration of shelf life.

I. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

J. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

K. Tool joints concave.

L. Compression Gaskets: Avoid joints except at ends, corners, and intersections; seal all joints with adhesive; install with face 1/8 to 1/4 inch below adjoining surface.

3.04 CLEANING

A. Clean adjacent soiled surfaces.

3.05 PROTECTION

A. Protect sealants until cured.

END OF SECTION

SECTION 07 95 13

EXPANSION JOINT COVER ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Expansion joint assemblies for floor, wall, ceiling and roof surfaces.

1.02 RELATED REQUIREMENTS

A. Section 03 4500 - Architectural Precast Concrete.

B. Section 07 9200 - Joint Sealants: Expansion and control joint finishing utilizing a sealant and bond breaker.

C. Section 09 2116 - Gypsum Board Assemblies.

D. Section 09 5123 – Acoustical Tile Ceilings.

1.03 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2008.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide joint assembly profiles, profile dimensions, anchorage devices, available colors and finish.

C. Shop Drawings: Indicate joint and splice locations, butt joints, corners, miters, layout of the work, affected adjacent construction, dimensions, materials, metal gage fasteners, anchorage locations and other pertinent construction and erection details. Where joint systems change planes, provide clearly detailed isometric or other drawings fully describing component interconnection.

D. Samples: Submit two samples 12 inch long, illustrating profile, dimension, color, and finish selected including corner units.

E. Product Data: Submit product data, including manufacturer's specifications, catalog cuts, color samples and written installation instructions.

F. Test Reports: Submit test reports for fire resistance rating.

G. Manufacturer's Installation Instructions: Indicate rough-in sizes; provide templates for cast-in or placed frames or anchors; required tolerances for item placement.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the project site in their original unopened containers or packages or bundles bearing label clearly identifying manufacturer' s name, brand name and other pertinent information.

B. Store materials in properly protected and dry storage facilities until ready for use.

C. Handle expansion joints in manner to protect surfaces and to prevent distortion and other types of damage to elastomeric materials.

1.06 WARRANTY

A. Special Warranty:
   1. Warrant prefabricated expansion joints for 5 years against defective materials, deterioration, workmanship and leaks, except leaks caused by abuse, lightning, hurricane, tornado, hail storm, unusual climatic phenomena or failure of related work installed by other parties.
   2. During the warranty period, restore defective work to the standard of the Contract Documents, including materials, labor, refinishing and other costs incidental to the work. Within 24 hours after receipt of notice from the Owner, inspect the Work and immediately repair leaks in the Work. Restore Work found to be defective within 10 days after receipt of notice from the Owner.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Expansion Joint Cover Assemblies:
   1. Balco, Inc: www.balcousa.com.
   2. Construction Specialties, Inc: www.c-sgroup.com.
   3. MM Systems Corp: www.mmsystemscorp.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 EXPANSION JOINT COVER ASSEMBLIES

A. Expansion Joint Cover Assemblies - General: Factory-fabricated and assembled; designed to completely fill joint openings, sealed to prevent passage of air, dust, water, smoke; suitable for traffic expected. Field fabricated or modified assemblies will not be accepted.
   1. Provide interior and exterior expansion joint systems from one manufacturer only unless substitutions are approved by the Architect.
   2. Joint Dimensions and Configurations: As indicated on drawings.
   3. Joint Cover Sizes: Selected to suit joint width and configuration, based on manufacturer's published recommendations and limitations.
   4. Joint Cover Styles: As indicated on drawings.
   5. Lengths: Provide covers in full lengths required; avoid splicing wherever possible.
   6. Anchors, Fasteners, and Fittings: Provided by cover manufacturer.

B. Floor Joint Covers: Coordinate with indicated floor coverings.

C. Resilient Seal Type Covers: Having flat exposed surface without crevices that could collect dirt; designed to withstand expected movement without extrusion of seal from joint assembly; for floors, provide style that is flush with top of floor covering; for exterior joints, weathertight.

D. Sliding Cover Plate Type Covers: Provide plate with beveled edges and neat fit that does not collect dirt.

E. Covers In Gypsum Board Assemblies: Provide style with anchoring wings that can be completely covered by joint compound.

F. Covers In Fire Rated Assemblies: Provide cover assembly having fire rating equivalent to that of assembly into which it is installed.
   1. Acceptable Evaluation Agencies: UL, ULC, and Intertek.

2.03 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper; or ASTM B308/B308M, 6061 allow, T6 temper.
   1. Exposed Finish Outdoors: Natural anodized.
   2. Exposed Finish at Floors: Mill finish or natural anodized.
   3. Exposed Finish at Walls and Ceilings: Natural anodized.

B. Resilient Seals:
   1. For Ceilings: Any resilient material, flush, pleated, or hollow gasket.
   2. Color: As selected by Architect from manufacturer's custom colors.

C. Anchors and Fasteners: As recommended by cover manufacturer.

D. Ferrous Metal Anchors: Galvanized where embedded in concrete or in contact with cementitious materials.

E. Threaded Fasteners: Stainless steel.

F. Backing Paint for Aluminum Components in Contact with Cementitious Materials: Asphaltic type.

G. Sealant: Silicone, as recommended by expansion joint and sealant manufacturers.

H. Fire Insulator Panel: Manufacturer's standard material with galvanized steel flange designed to meet required fire rating.

2.04 FABRICATION

A. Joint Covers: Aluminum cover plate, aluminum frame construction, retainers with resilient elastomeric filler strip, designed to permit plus or minus 50 percent joint movement with full recovery, flush and recess mounted as indicated on the Drawings.

B. Back paint components in contact with cementitious materials.

C. Galvanize embedded ferrous metal anchors and fastening devices.

D. Shop fabricate connections, assemblies and components and package with anchors and fittings. Field fabrication of connections and assemblies is not acceptable.

E. Provide joint components in single length wherever practical. Minimize site splicing.

2.05 FINISHES

A. Floors: Mill finish.

B. Walls and Ceilings: Clear anodized.

C. Resilient Filler Exposed to View: Color to be determined by Architect from manufacturer's custom colors.

2.06 ACCESSORIES

A. Provide adhesive, elastomeric sheet and other accessories as required for installation, adhering butt joints, terminations, transitions, change of direction accessories, and covering of joints.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joint preparation and dimensions are acceptable and in accordance with manufacturer's requirements.

3.02 PREPARATION

A. Install anchoring devices in conformance to templates.

3.03 INSTALLATION

A. Install components and accessories in accordance with manufacturer's instructions.

B. Align work plumb and level, flush with adjacent surfaces where noted on the drawings.

C. Rigidly anchor to substrate to prevent misalignment.

3.04 PROTECTION

A. Do not permit traffic over unprotected floor joint surfaces.

B. Provide strippable coating to protect finish surface.

3.05 SCHEDULES

A. Interior Expansion Joints:
   1. (EJ1)-Balco 2HFFB-15
   2. (EJ2)-Balco NBR-5x3/8”
   3. (EJ3)-Balco NBRL-5x3/8”
   4. (EJ4)-Balco TCS-4
   5. (EL5)-Balco ACVSC-3

B. Exterior Expansion Joints:
   1. 2-1/2” and 5”-EMSEAL Seismic Colorseal.
   2. 10” Balco EV 10
   3. 5” Balco RW 5g
   4. 10” Balco RW 10g
   5. 10”-C/S-ESC-1000.
   6. 10”-C/S-ESW-1000.

C. Refer to drawings for additional expansion joints not included above.

END OF SECTION

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated steel doors and frames.

B. Steel frames for wood doors.

C. Fire-rated steel doors and frames.

D. Thermally insulated steel doors.

E. Sound-rate steel door frames.

F. Steel glazing frames.

G. Accessories, including glazing and matching panels.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

B. Section 01 6000 - Product Requirements: Substitution procedures.

C. Section 08 7110 - Door Hardware.

D. Section 08 8000 - Glazing: Glass for doors and borrowed lites.

E. Section 09 9000 – Painting and Coating: Field painting.

1.03 REFERENCE STANDARDS

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.

B. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames; 2003.

C. ANSI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 1998 (R2004).

D. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

E. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2010.

F. ASTM A 879 - Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface; 2006.

G. ASTM A1008 - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2012.

H. ASTM A1011 - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2012.

I. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2006.

J. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors

and Frames; The National Association of Architectural Metal Manufacturers; 2007.

K. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2010.

L. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

M. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.

C. Shop Drawings:
1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thickness.
3. Frame details for each frame type, including dimensioned profiles and metal thickness.
4. Location of reinforcement and preparations for hardware.
5. Details of moldings, removable stops and glazing.
6. Details of conduit and preparations for power, signal and control systems.

D. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers of details and openings as those on Drawings. Coordinate with door hardware schedule.

E. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project. When approved by the Architect they will become the basis for accepting or rejecting actual installation procedures used in the Work.

F. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.

B. Source Limitations: Obtain standard steel doors and frames through one source from a single manufacturer.

C. Fire Rated Door, Sidelight and Transom Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated. Identify each fire door and frame with UL labels, indicating the applicable fire rating.

D. All doors shall conform to the requirements of ANSI A250.8, "SDI 100 Recommended Specification for Standard Steel Doors and Frames".

E. Maintain at the project site a copy of all reference standards dealing with installation.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames palletized, wrapped or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.

B. Store in accordance with NAAMM HMMA 840.

C. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

1.07 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Doors and Frames:
   1. Assa Abloy Ceco: www.assaabloydss.com.
   2. Republic Doors: www.republicdoor.com.
   3. Steelcraft: www.steelcraft.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Cold Rolled Steel: ASTM A1008, Commercial Steel, commercial quality, coil or leveled.

B. Hot-Rolled Steel Sheet: ASTM A1011, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Galvannealed Steel: Commercial quality, hot dipped, A-40 galvannealed steel in accordance with ASTM A653. A-60 galvannealed steel shall be supplied when specified.

D. Frame Anchors: ASTM A897 Commercial Steel (CS), mill phosphatized.
   1. For anchors built into exterior walls, steel sheet complying with ASTM A1008 or ASTM A1011, hot-dip galvanized according to ASTM A153, Class B.

E. Inserts, Bolts and Fasteners: Hot-dip galvanized according to ASTM A153.

F. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.

2.03 DOORS AND FRAMES

A. Requirements for All Doors and Frames:
   1. Accessibility: Comply with ANSI/ICC A117.1.
   2. Door Top Closures: Flush with top of faces and edges.
   3. Door Edge Profile: Beveled on both edges.
   4. Door Texture: Smooth faces.
   5. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
   6. Hardware Preparation: In accordance with BHMA A156.115, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
   7. Finish: Factory primed, for field finishing.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with all the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.04 STEEL DOORS

A. Exterior Doors:
   1. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless.
   2. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvanealed) in

accordance with ASTM A653, with A60/ZF180 coating.
3. Insulated door shall have:
   a. A "U" value of 0.10 for a polyurethane core.
   b. A "U" value of 0.13 for a polystyrene core.
4. Weatherstripping: Separate, see Section 08710.

B. Interior Doors, Non-Fire-Rated:
1. Grade: ANSI A250.8 Level 2, physical performance Level B, Model 2, seamless.
2. Core: Vertical steel stiffeners.
3. Thickness: 1-3/4 inches.

C. Interior Doors, Fire-Rated:
1. Grade: ANSI A250.8 Level 2, physical performance Level B, Model 2, seamless.
2. Fire Rating: As indicated on Door and Frame Schedule, tested in accordance with UL 10C ("positive pressure").
   a. Stairwell Door Rate of Temperature Rise Across Door Thickness: 450 F degrees.
   b. Provide units listed and labeled by UL.
   c. Attach fire rating label to each fire rated unit.

D. Transom Panels: Same construction, performance, and finish as doors.

2.05 STEEL FRAMES

A. General:
1. Comply with the requirements of grade specified for corresponding door.
   a. ANSI A250.8 Level 2 Doors: 16 gage frames.
   b. ANSI A250.8 Level 3 Doors: 14 gage frames.
   c. Frames for Wood Doors: Comply with frame requirements specified in ANSI A250.8 for Level 1, 16 gage
2. Finish: Factory primed, for field finishing.
3. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
4. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches high to fill opening without cutting masonry units.
5. Frames Wider Than 36 Inches: Reinforce with steel channel fitted tightly into jambs and frame head, flush with top. As an alternative 14 ga. frames are acceptable.
6. Frames Installed Back-to-Back: Reinforce with steel channels anchored to floor and overhead structure.

B. Exterior Door Frames: Fully welded.
1. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653, with A60/ZF180 coating.
2. Weatherstripping: See Section 08 7100.

C. Interior Door Frames, Non-Fire-Rated: Fully welded type.
1. Removable Transom Bar (Horizontal and Vertical): Refer to drawings for locations. Profile to match frame.

D. Interior Door Frames, Fire-Rated: Fully welded type.
1. Fire Rating: Same as door, labeled.

E. Sound-Rated Door Frames: Fully welded type.
1. Equal to Pioneer Industries, WF Series, Uni-Seal Gasket.

F. Mullions for Pairs of Doors: Fixed, except where removable is indicated, of profile similar to jambs.

G. Frames for Interior Glazing or Borrowed Lights: Construction and face dimensions to match

door frames, and as indicated on drawings.

2.06 FRAME ANCHORS

A. Jamb Anchors:
   1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
   2. Stud Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
   3. Compression Type for Drywall Slip-On Frames: Adjustable compression anchors.
   4. Expansion Type for In-Place Concrete or Masonry: Minimum 3/8 inch bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick and as follows:
   1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
   2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2 inch height adjustment. Terminate bottom of frames at finish floor surface.

2.07 ACCESSORY MATERIALS

A. Glazing: As specified in Section 08 8000, factory installed.

B. Stops and Moldings:
   1. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick, fabricated from same material as door face sheet in which they are installed.
   2. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.
   3. Removable Stops: Formed sheet steel, minimum 0.032 inch thick, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

C. Astragals for Double Doors: Specified in Section 08 7110.
   1. Fire-Rated Doors: Steel, shape as required to accomplish fire rating.

D. Grout for Frames: Portland cement grout of maximum 4-inch slump for hand troweling; thinner pumpable grout is prohibited.

E. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.

F. Temporary Frame Spreaders: Provide for all factory- or shop-assembled frames.

2.08 FINISH MATERIALS

A. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.

B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

2.09 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

C. Hollow Metal Doors:
   1. Exterior Doors: Provide weep holes openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
   2. Glazed Lites: Factory cut openings in doors.
   3. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.

D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
   1. Welded Frames: Weld flush face joints continuously; grind, fill, dress and make smooth, flush and not visible.
   2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding. Provide counter sunk fasteners at removable transom bars. Transom bars to match frame profile.
   3. Provide countersunk, flat or oval head exposed screws and bolts for exposed fasteners unless otherwise indicated.
   4. Plaster/Grout Guards: Weld guards to frame at back of hardware mortises in frames installed in concrete or masonry and to be grouted.
   5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
   6. Jamb Anchors: Provide number and spacing of anchors as follows:
      a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches on center and as follows:
         1) Two anchor per jamb up to 60 inches high.
         2) Three anchors per jamb from 60 to 90 inches high.
         3) Four anchors per jamb from 90 to 120 inches high.
         4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
      b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches on center and as follows:
         1) Three anchors per jamb up to 60 inches high.
         2) Four anchors per jamb from 60 to 90 inches high.
         3) Five anchors per jamb from 90 to 96 inches high.
         4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
         5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
      c. Compression Type: Not less than two anchors in each jamb.

E. Fabricate concealed stiffeners, edge channels and hardware reinforcement from either cold or hot rolled steel sheet.

F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling and tapping according to the door hardware schedule and templates furnished as specified in Section 08700 Door Hardware.
   1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
   2. Reinforce doors and frames at the manufacturer's plant to receive non-templated, mortised and surface mounted door hardware.
   3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 series specifications for preparation of hollow metal work for hardware.
   4. Coordinate locations of conduit and wiring boxes for electrical connections with applicable sections of the electrical division.

G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
   1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
   2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
   3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
   4. Provide loose stops and moldings on inside of hollow metal work.
   5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Examine rough-ins for embedded and built in anchors to verify actual locations before frame installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Remove welded-in shipping spreaders installed at the factory. Restore exposed finish by grinding, filling and dressing, as required to make repaired area smooth, flush and invisible on exposed faces

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist and plumbness to the following tolerances:
   1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines and perpendicular to plane of wall.
   4. Plumbness: Plus or minus 1/16 inch, measured at jams on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive non-templated, mortised and surface mounted door hardware.

D. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

A. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.

B. In addition, install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Where frames are fabricated in sections because of shipping and handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress and make splice smooth, flush and invisible on exposed faces.

E. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

F. Remove temporary braces necessary for installation only after frames have been properly set and secured.

G. Check plumbness, squareness and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

H. Coordinate installation of hardware.

I. Coordinate installation of glazing. Secure stops with countersunk flat or oval head machine screws spaced uniformly mot more than 9 inches on center and not more than 2 inches on center from each corner.

J. Coordinate installation of electrical connections to electrical hardware items.

3.04 CLEARANCES

A. Fit non-fire rated hollow metal doors accurately in frames, within clearances specified below and in accordance with ANSI/SDI A250.8.:
   1. The clearance between the door and frame head and jambs shall be 1/8 inch in the case of both single swing and pairs of doors.
   2. The clearance between the meeting edges of pairs of doors shall be 3/16 inch, plus or minus 1/16 inch. For fire rated applications, the clearance between the meeting edges of pairs of doors shall be 1/8 inch, plus or minus 1/16 inch.
   3. The clearance at the bottom of the door and top of finished floor shall be 3/4 inch (no threshold).
   4. The clearance at the bottom of door and top of threshold shall be 3/8 inch.
   5. The clearance between the face of the door and door stop shall be 1/16 to 1/8 inch.
   6. All clearances shall be, unless otherwise specified, subject to a tolerance of plus or minus 1/32 inch.

B. Fire Rated Doors: Install doors with clearances according to NFPA 80.

C. Smoke Control Doors: Install doors with clearances according to NFPA 105.

3.05 ADJUSTING

A. Adjust for smooth and balanced door movement.

B. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed or otherwise unacceptable.

C. Remove grout and other bonding material from hollow metalwork immediately after installation.

D. Prime Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

3.06 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

B. Doors for all rooms labeled “Proposed Storm Shelter” provide:

1. Doors: 16 ga.faces, fire rated where indicated.

2. Frames: 14 ga. With 5 anchors per jamb. Provide double 20 ga. Stud framing for door jambs, from slab to deck above.

END OF SECTION

SECTION 08 14 16
FLUSH WOOD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES
A. Interior Flush Wood Doors:
   1. Interior laminate faced wood doors.
   2. Flush fire-rated wood doors.
   3. Flush doors with glass lites.

1.2 REFERENCES
A. ANSI A208.1 – Particleboard.
B. ASTM E 90 – Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
C. ASTM E 413 – Classification for Rating Sound Insulation.
D. AWI/AWMAC/WI Architectural Woodwork Standards, Edition 1, Section 9 – Doors.
E. NFPA 80 – Standard for Fire Doors and Other Opening Protectives.
F. UL 10C – Positive Pressure Fire Tests of Door Assemblies.
G. WDMA I.S. 1A-11 – Architectural Wood Flush Doors.

1.3 SUBMITTALS
A. Comply with Section 01 3300 – Submittal Procedures.
B. Product Data: Submit manufacturer's product data, including door construction description and WDMA I.S.1-A and AWS classifications.
C. Schedules: Submit manufacturer's schedules, including door dimensions, cutouts, species, finish, and hardware. Reference individual door numbers as indicated on the Drawings.
D. Samples: Submit manufacturer's door finish samples, showing range of color variation.
E. Test Reports: Submit manufacturer's test results of STC ratings from testing performed by independent testing agency for sound-retardant doors.
F. Manufacturer's Certification: Submit manufacturer's certification that doors comply with specified requirements and are suitable for intended application.
H. Cleaning Instructions: Submit manufacturer's cleaning instructions for doors.
I. Warranty: Submit manufacturer's standard warranty.

1.4 QUALITY ASSURANCE
A. Tolerances for Warp, Telegraphing, Squareness, and Prefitting Dimensions: WDMA I.S.1-A.
B. Identifying Label: Each door shall bear identifying label indicating:
   1. Door manufacturer.
   2. Order number.
   3. Door number.
   4. Fire rating, if applicable.
C. Fire-Rated Doors: Labeled by Intertek/Warnock Hersey.
   1. Construction Details and Hardware Application: Approved by labeling agency.
   2. Core:
      b. Particleboard Core:
         1) Forest Stewardship Council (FSC) certified.
         2) Pre-consumer recycled material.
         3) No added urea formaldehyde.
         4) CARB NAF / ULEF

1.5 DELIVERY, STORAGE, AND HANDLING
A. Delivery:

1. Deliver doors to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
2. Package doors individually in polybags.

B. Storage:
1. Store doors in accordance with manufacturer's instructions.
2. Store doors in clean, dry area indoors, protected from damage and direct sunlight.
3. Store doors flat on level surface.
4. Do not store doors directly on concrete.
5. Keep doors completely covered. Use covering which allows air circulation and does not permit light to penetrate.
6. Store doors between 50 and 90 degrees F (10 and 32 degrees C) and 30 to 50 percent relative humidity.

C. Handling:
1. Handle doors in accordance with manufacturer's instructions.
2. Protect doors and finish during handling and installation to prevent damage.
3. Handle doors with clean hands or clean gloves.
4. Lift and carry doors. Do not drag doors across other doors or surfaces.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Do not subject doors to extreme conditions or changes in temperature or relative humidity in accordance with WDMA I.S.1-A.

1.7 WARRANTY

A. Warrant solid core, interior doors for life of installation against warpage, delamination, and defects in materials and workmanship.

B. Defects noted during warranty period shall be corrected at no cost to Owner. Corrective work shall include labor and material for repair, replacement, refinishing, and rehanging as required.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Basis of Design: Cendura Series., Mohawk by Masonite.

B. Approved Equal

2.2 GENERAL

A. Glass Mouldings:
1. Non-rated Flush Doors: Wood to match door veneer.
2. Fire-Rated Doors: Steel vision frame, beige prime finish.

B. Glazing: ¼" Clear tempered glass.

2.3 SOLID CORE LAMINATE DOORS

A. Doors:
1. Model:
   a. HPDL face particleboard core, non-rated and 20-minute rated.
2. Compliance: WDMA I.S.1-A.
   a. Aesthetic Grade: Custom.
   b. Duty Level: Extra heavy duty.
3. Seven-Ply and Non-Bonded Core Construction: Not acceptable.
4. Door Thickness: 1-3/4 inches.
5. STC Rating: STC 30
6. Stiles: Structural Composite Lumber (SCL) With HPDL: Match face veneer.
7. Rails: Structural composite lumber (SCL). Factory Sealed.
8. Core: Particleboard

9. Door Assembly:
   Sand entire assembly flat as a unit to ensure minimal telegraphing of core components through face veneers.
10. Composite Crossbands:
    a. Apply to core in hot press using Type I, exterior, water-resistant adhesive, before application of hardwood edges.
    b. Exposed Crossbanding: Not allowed along stile edges.
11. Laminate:
    a. HDPL, Nema LD 3

2.7 FABRICATION

A. Prefit Doors:
   1. Prefit and bevel doors at factory to fit openings.
   2. Prefit Tolerances: WDMA I.S.1-A and AWS Section 9.
B. Factory-machine doors for mortised hardware, including pilot holes for hinge screws and lock fronts required.

2.8 FINISHES

A. Doors shall receive factory finishing.
B. Top and Bottom Rails: Factory sealed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine locations to receive doors. Notify Architect of conditions that would adversely affect installation or subsequent use. Do not begin installation until unacceptable conditions are corrected.
B. Ensure frames are solidly anchored, allowing no deflection when doors are installed.
C. Ensure frames are plumb, level, square, and within tolerance.

3.2 PREPARATION

A. Allow doors to become acclimated to building temperature and relative humidity for a minimum of 24 hours before installation.

3.3 INSTALLATION

A. Install doors in accordance with manufacturer's instructions.
B. Install doors at locations indicated on the Door Schedule and Drawings.
C. Install doors plumb, level, and square.
D. Install door hardware as specified in Section 08 7100.

3.4 ADJUSTING

A. Adjust doors to swing freely, without binding in frame.
B. Adjust hardware to operate properly.
C. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.
D. Remove and replace damaged doors that cannot be successfully repaired, as determined by Architect.

3.5 CLEANING

A. Clean doors promptly after installation in accordance with manufacturer's instructions.
B. Do not use harsh cleaning materials or methods that could damage finish.

3.6 PROTECTION

A. Protect installed doors from damage during construction.

END OF SECTION

SECTION 08 31 00

ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall access door and frame units.

B. Ceiling access door and frame units.

C. Floor access door and frame units, interior.

D. Ladder safety posts.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

B. Section 01 6000 - Product Requirements: Substitution procedures.

C. Section 09 2116 - Gypsum Board Assemblies.

D. Section 09 9100 – Painting and Finishing: Field paint finish.

1.03 REFERENCE STANDARDS

A. ASTM A 123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2009.

B. ASTM A 153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

C. ASTM A 780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2009.

D. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2011a.

E. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.

F. National Fire Protection Association - NFPA 252; Standard Methods of Fire Tests of Door Assemblies; 2008.

G. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, fire ratings (where required) and details of adjoining work.

C. Shop Drawings: Indicate exact position of all access door units and details of wall and ceiling installations.

D. Schedule: Provide complete door and frame schedule, including types, general locations, sizes, construction details, latching or locking provisions and other data pertinent to installation.

E. Manufacturer's Installation Instructions: Indicate installation requirements.

F. Project Record Documents: Record actual locations of all access units.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain doors and fames through one source from a single manufacturer.

B. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are labeled and listed by UL, ITS or another testing and inspecting agency acceptable to authorities having jurisdiction.
   1. NFPA 252 or UL 10 B for vertical access doors.
   2. ASTM E or UL 263 for horizontal access doors and frames.

C. Fire-resistive rated doors shall conform to standards of local building inspector.

D. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

E. Manufacturer's Standard Warranty: Floor doors and ladder safety posts shall be free of defects in material and workmanship for a period of five years from Substantial Completion.

1.06 PRODUCT HANDLING

A. All materials shall be delivered in manufacturer's original packaging.

B. Store materials in a dry, protected, well-vented area. The contractor shall thoroughly inspect product upon receipt and report damaged material immediately to delivering carrier and note such damage on the carrier's freight bill of lading.

C. Remove protective wrapping immediately after installation.

1.07 COORDINATION

A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed equipment and indicate on schedule specified in "Submittals" Article.

PART 2 PRODUCTS

2.01 ACCESS DOOR AND PANEL APPLICATIONS

A. Walls, unless otherwise indicated:
   1. Material: Steel.
   2. Size: As indicated on Drawings
   3. Tool-operated spring or cam lock where noted.
   4. Standard duty, hinged door.
   5. Screwdriver operated latch.
   6. In Gypsum Board: Drywall bead frame with door surface flush with wall surface.
   7. In Masonry and Tile: Surface mounted frame with door surface flush with frame surface.

B. Walls in Wet Areas:
   1. Material: Steel, hot-dipped galvanized.
   2. Size: As indicated on Drawings.
   3. Standard duty, hinged door.
   4. Screwdriver operated latch.
   5. In Gypsum Board: Drywall bead frame with door surface flush with wall surface.
   6. In Masonry and Tile: Surface mounted frame with door surface flush with frame surface.

C. Fire Rated Walls: See drawings for wall fire ratings.
   1. Material: Steel.
   2. Size: As indicated on Drawings.
   3. Uninsulated, single thickness door panel.
   4. Tool-operated spring or cam sliding latch.

D. Ceilings, unless otherwise indicated: Same type as for walls.
   1. Material: Steel.
   2. Size in Gypsum Board Ceilings: As indicated on Drawings.
   3. Standard duty, hinged door.

4. Screwdriver operated latch.

2.02 WALL AND CEILING UNITS

A. Manufacturers:
   1. Acudor Products Inc: www.acudor.com.
   2. Karp Associates, Inc: www.karpinc.com.
   3. Milcor by Commercial Products Group of Hart & Cooley, Inc: www.milcorinc.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Access Doors: Factory fabricated door and frame units, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp; coordinate requirements with assemblies units are to be installed in.
   1. Door Style: Single thickness with rolled or turned in edges.
   2. Frames: 16 gage, 0.0598 inch, minimum.
   3. Single Thickness Steel Door Panels: 0.070 inch, minimum.
   4. Units in Fire Rated Assemblies: Fire rating as required by applicable code for the fire rated assembly in which they are to be installed.
      a. Provide products listed and labeled by UL or ITS (Warnock Hersey) as suitable for the purpose specified and indicated.
      b. Provide certificate of compliance from authority having jurisdiction indicating approval of fire rated doors.
   5. Steel Finish: Primed.
   6. Hardware:
      a. Hardware for Fire Rated Units: As required for listing.
      b. Hinges for Non-Fire-Rated Units: Continuous piano hinge, concealed.
      c. Hinges for Fire-Rated Units: Continuous piano hinge, exposed.

2.03 FLOOR UNITS

A. Floor Access Doors (Basis of Design):
   1. Bilco Company; Type Q, steel, indoors: www.bilco.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Floor Door and Frame Units: Factory fabricated, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp; coordinate requirements with assemblies units are to be installed in.
   1. Size: 3'-0" x 2'-6".
   2. Hardware: Steel, hot-dipped galvanized.
      a. Hinges: Cast steel cam-action hinges which pivot on torsion bars designed for horizontal installation and bolted to underside of cover.
      b. Mechanisms: Cam-action hinges on torsion bars for controlled cover operation throughout entire arc of opening and act as a check in retarding downward motion of the cover when closing.
      c. Keyed Cylinder Lock: Cylinder lock, two keys for each unit.
         1) Provide turn knob on interior side of cylinder lock.
         2) Provide cylinder lock on each floor door.
      d. Removable exterior wrench lift handle with a spring loaded ball detent.
      e. Type 316 stainless steel snap lock with fixed handles shall be mounted on the underside of the cover.
      f. Cover shall be equipped with a steel hold open arm that automatically locks the cover in the open position.

C. Interior Units: Steel, minimum 1/4 inch thick.
   1. Design Load: Design to support live load of 150 lb/sq ft with deflection not to exceed 1/180 of span.
   2. Design Load: Design to support live load of 150 lb/sq ft with deflection not to exceed 1/150 of span.

3. Operation: Controlled manual operation throughout entire arc of opening and closing.
4. Cover: 1/4 inch steel diamond pattern plate.
5. Cover: 1/4 inch steel diamond pattern with steel grating.
   a. Grating: 3/16 inch bearing bars at 1-3/16 inches on center spacing and cross bars at 4 inches on center. Depth of bearing bars is 2 inches.
6. Finish: Galvanized

2.04 LADDER SAFETY POSTS:

A. Ladder Safety Posts (Basis of Design):
   1. Bilco Company; LU-1: www.bilco.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Telescoping tubular section that locks automatically when fully extended. Upward and downward movement controlled by a stainless steel spring balance mechanism. Unit shall be completely assembled with fasteners for securing to the ladder rungs in accordance with manufacturer's instructions.

C. Post: Manufactured of high strength square tubing. Provide pull loop at upper end of post to facilitate raising the post.

D. Hardware: All mounting hardware shall be Type 316 stainless steel.

E. Factory Finish: Yellow powder coat.

F. Install post at each floor access door ladder.

2.05 FABRICATION

A. General: Provide access door assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names or roughness.

C. Steel Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
   1. Exposed Flanges: Nominal 1 inch wide around perimeter of frame.
   2. For trimless frames with drywall bead for installation in gypsum board assembly, provide edge trim for gypsum board securely attached to perimeter of frames.
   3. Provide mounting holes in frames to attach frames to metal framing and drywall construction and to attach masonry anchors in masonry construction.

D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

2.06 METALLIC-COATED STEEL FINISHES

A. Galvanizing of Steel Shapes and Plates: Hot-dip galvanize items indicated to comply with applicable standards listed below:
   1. ASTM A 123, for galvanizing steel and iron products.
   2. ASTM A 153, for galvanizing steel and iron hardware.

B. Surface Preparation: Clean surfaces with non-petroleum solvent so surfaces are free of oil and other contaminants. For galvanized surfaces, apply, after cleaning, a conversion coating suited to the organic coating to be applied over it. For metallic-coated surfaces, clean welds, mechanical connections and abraded areas and apply galvanizing repair paint specified below to comply with ASTM A 780.
   1. Galvanizing Repair Paint: High-zinc -dust-content paint for re-galvanizing welds in steel, complying with SSPC-Paint 20.

C. Factory Priming for Field-Painted Finish: Apply shop primer immediately after cleaning and pre-treating.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's written instructions.

B. Install frames plumb and level in openings. Secure rigidly in place.

C. Install access doors with trimless frames flush with adjacent surfaces or recessed to receive finish material.

D. Position units to provide convenient access to the concealed work requiring access.

E. Install floor doors and safety ladder posts in accordance with manufacturer's written instructions.

3.03 ADJUSTING AND CLEANING

A. Adjust doors and hardware after installation for proper operation.

B. Remove and replace doors and frames that are warped, bowed or otherwise damaged.

END OF SECTION

SECTION 08 33 23

OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Service doors.
2. Insulated service doors.
3. Fire-rated service doors.
4. Fire-rated, insulated service doors.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for miscellaneous steel supports, door-opening framing, corner guards, and bollards.
2. Section 099113 “Exterior Painting” and Section 099123 “Interior Painting” for finish painting of factory-primed doors.
3. Section 111200 "Parking Control Equipment" for parking control equipment interlocked to overhead coiling doors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
3. Include description of automatic-closing device and testing and resetting instructions.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. For exterior components, include details of provisions for assembly expansion and contraction and for excluding and draining moisture to the exterior.
5. Show locations of controls, locking devices, and other accessories.
6. Include diagrams for power, signal, and control wiring.

C. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:

1. Curtain slats[.

2. Bottom bar.
3. Guides.
4. Brackets.
5. Hood.
6. Locking device(s).
7. Include similar Samples of accessories involving color selection.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installer.

1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
2. Submit copy of DHI Fire and Egress Door Assembly Inspector (FDAI) certificate.

B. Oversize Construction Certification: For door assemblies required to be fire-rated and that exceed size limitations of labeled assemblies.

C. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Special warranty.

B. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

C. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

1. Maintenance Proximity: Not more than 2 hours' normal travel time from Installer's place of business to Project site.

B. Fire-Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire-rated door assemblies is to meet the qualifications set forth in NFPA 80, Section 5.2.3.1 and the following:

1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of doors that fail in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain overhead coiling doors from single source from single manufacturer.

1. Obtain operators and controls from overhead coiling-door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Sound-Control Doors: Assemblies tested in a laboratory for sound-transmission-loss performance according to ASTM E90, calculated according to ASTM E413, and rated for not less than the STC value indicated.

B. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design".

C. Structural Performance, Exterior Doors: Capable of withstanding the following design wind loads:

1. Design Wind Load: As indicated on Drawings.

2.3 DOOR ASSEMBLY

A. Overhead Coiling Door: Insulated service overhead coiling door formed with curtain of interlocking metal slats.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hormann Flexon LLC: Speed-Guardian™ Rigid High Performance Door Series or comparable product by one of the following:

a. Hormann Flexon LLC: Speed-Guardian™ Rigid High Performance Door Series

B. Operation Cycles: Door components and operators capable of operating for not less than 100,000 cycles. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

1. Include tamperproof cycle counter.

C. Air Infiltration: Maximum rate of [0.4 cfm/sq. ft.] at 15 mph when tested according to ASTM E283 or DASMA 105.

D. STC Rating: 50.

E. Insulated Door Curtain R-Value: 20.

F. Door Curtain Material: Galvanized steel or Stainless steel.

G. Door Curtain Slats: Flat profile slats of 1-7/8-inch or 2-5/8-inch center-to-center height.

1. Insulated-Slat Interior Facing: Metal or Plastic.
2. Gasket Seal. Manufacturer's standard continuous gaskets between slats.

H. Bottom Bar: Two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick; fabricated from hot-dip galvanized steel, stainless steel or aluminum extrusions and finished to match door.

I. Curtain Jamb Guides: Galvanized steel or Stainless steel with exposed finish matching curtain slats.

J. Hood: Match curtain material and finish.

1. Shape: Round or Square.
2. Mounting: As indicated on Drawings

K. Locking Devices: Equip door with locking device assembly.

L. Electric Door Operator:

1. Usage Classification: Standard duty, up to 25 cycles per hour and up to 90 cycles per day
2. Operator Location: As indicated on Drawings.
3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 ft. or lower
4. Motor Exposure: Interior Motor Electrical Characteristics:

    a. Horsepower: 3 hp.
    b. Voltage: As indicated on Electrical Drawings.

5. Emergency Manual Operation: Chain or Crank type.
6. Obstruction-Detection Device: Automatic photoelectric sensor edge on bottom bar or pneumatic sensor edge on bottom bar.

    a. Sensor Edge Bulb Color: Black

7. Control Station(s): Where indicated on Drawings.
8. Other Equipment: Audible and visual signals.

M. Curtain Accessories: Equip door with weatherseals, pole hook and automatic-closing device.

N. Door Finish:

1. Aluminum Finish: Anodized color as selected by Architect from full range of industry colors and color densities.
2. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.
3. Interior Curtain-Slat Facing: Finish as selected by Architect from manufacturer's full range.

2.4 MATERIALS, GENERAL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to

withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural-steel sheet; complying with ASTM A653/A653M, with G90 zinc coating; nominal sheet thickness (coated) of 0.028 inch; and as required.
2. Stainless Steel Door Curtain Slats: ASTM A240/A240M or ASTM A666, Type 304; sheet thickness of 0.025 inch; and as required.
3. Aluminum Door Curtain Slats: ASTM B209 sheet or ASTM B221 extrusions, alloy and temper standard with manufacturer for type of use and finish indicated; thickness of 0.050 inch; and as required.
4. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E84 or UL 723. Enclose insulation completely within slat faces.
5. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face, with minimum steel thickness of 0.010 inch.

B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain and a continuous bar for holding windlocks.

2.6 HOODS

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

1. Galvanized Steel: Nominal 0.028-inch- thick, hot-dip galvanized-steel sheet with G90 zinc coating, complying with ASTM A653/A653M.
2. Stainless Steel: 0.025-inch- thick, stainless steel sheet, Type 304, complying with ASTM A240/A240M or ASTM A666.
3. Aluminum: 0.040-inch- thick aluminum sheet complying with ASTM B209, of alloy and temper recommended by manufacturer and finisher for type of use and finish indicated.
4. Include automatic drop baffle on fire-rated doors to guard against passage of smoke or flame.

B. Removable Metal Soffit: Formed or extruded from same metal and with same finish as curtain if hood is mounted above ceiling unless otherwise indicated.

2.7 LOCKING DEVICES

A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.

B. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating

handle, cam plate, and adjustable locking bars to engage through slots in tracks.

1. Lock Cylinders: As specified in Section 087100 "Door Hardware"
2. Keys: Three for each cylinder.

C. Chain Lock Keeper: Suitable for padlock.

D. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.8 CURTAIN ACCESSORIES

A. Smoke Seals: Equip each fire-rated door with replaceable smoke-seal perimeter gaskets or brushes for smoke and draft control as required for door listing and labeling by a qualified testing agency.

B. Weatherseals for Exterior Doors: Equip each exterior door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated.

1. At door head, use 1/8-inch- thick, replaceable, continuous-sheet baffle secured to inside of hood or field-installed on the header.
2. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch- thick seals of flexible vinyl, rubber, or neoprene or nylon brushes.

C. Pull-Down Strap: Provide pull-down straps for doors more than 84 inches high.

D. Pole Hooks: Provide pole hooks and poles for doors more than 84 inches high.

2.9 COUNTERBALANCE MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless or welded carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.

C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

1. Fire-Rated Doors: Equip with auxiliary counterbalance spring and prevent tension release from main counterbalance spring when automatic-closing device operates.

D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.10 MANUAL DOOR OPERATORS

A. General: Equip door with manual door operator by door manufacturer.

B. Push-up Door Operation: Lift handles and pull rope for raising and lowering doors, with counterbalance mechanism designed so that required lift or pull for door operation does not exceed [25 lbf]<Insert value>.

C. Chain-Hoist Operator: Consisting of endless steel hand chain, chain-pocket wheel and guard, and gear-reduction unit with a maximum 25-lbf force for door operation. Provide alloy-steel hand chain with chain holder secured to operator guide.

D. Crank Operator: Consisting of crank and crank gearbox, steel crank drive shaft, and gear-reduction unit, of type indicated. Size gears to require not more than 25-lbf force to turn crank. Fabricate gearbox to be oiltight and to completely enclose operating mechanism. Provide manufacturer's standard crank-locking device.

2.11 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

1. Comply with NFPA 70.
2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Door Operator Location(s): Operator location indicated for each door.

1. Top-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on top of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Headroom is required for this type of mounting.
2. Front-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on coil side of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Front clearance is required for this type of mounting.
3. Wall Mounted: Operator is mounted to the inside front wall on the left or right side of door and connected to door drive shaft with drive chain and sprockets. Side room is required for this type of mounting. Wall-mounted operator can also be mounted above or below shaft; if above shaft, headroom is required.
4. Bench Mounted: Operator is mounted to the right or left door head plate and connected to the door drive shaft with drive chain and sprockets. Side room is required for this type of mounting.
5. Through-Wall Mounted: Operator is mounted on other side of wall from coil side of door.

D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated for each door assembly.

1. Electrical Characteristics: Minimum as indicated for each door assembly. If not indicated, large enough to start, accelerate, and operate door in either direction from any position,

at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.

2. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
3. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.

E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

1. Obstruction-Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel.Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.

    a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door closes only with sustained or constant pressure on close button.

2. Electric Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.

    a. Self-Monitoring Type: Four-wire-configured device designed to interface with door operator control circuit to detect damage to or disconnection of sensor edge.

3. Pneumatic Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device.

F. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."

1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
2. Exterior-Mounted Units: Full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated.

G. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf.

H. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

I. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

J. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with the accessibility standard.

2.12 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.13 ALUMINUM FINISHES

A. Mill Finish: Manufacturer's standard.

B. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

C. Color Anodic Finish: AAMA 611, AA-M12C22A32/A34, Class II, 0.010 mm or thicker.

D. Baked-Enamel or Powder-Coat Finish: AAMA 2603. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.14 STEEL AND GALVANIZED-STEEL FINISHES

A. Factory Prime Finish: Manufacturer's standard primer, compatible with field-applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

B. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

2.15 STAINLESS STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. Run grain of directional finishes with long dimension of each piece.
2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
3. Directional Satin Finish: ASTM A480/A480M No. 4.

C. Bright, Cold-Rolled, Unpolished Finish: ASTM A480/A480M No. 2B.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Install overhead coiling doors, hoods, controls, and operators at the mounting locations indicated for each door.

C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with the accessibility standard.

D. Fire-Rated Doors: Install according to NFPA 80.

E. Smoke-Control Doors: Install according to NFPA 80 and NFPA 105.

F. Power-Operated Doors: Install automatic garage doors openers according to UL 325.

3.3 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. After electrical circuitry has been energized, operate doors to confirm proper motor rotation and door performance.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

1. Adjust exterior doors and components to be weather resistant.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust seals to provide tight fit around entire perimeter.

3.5 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service includes 12 months' full maintenance by skilled employees of coiling-door Installer. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Parts and supplies are to be manufacturer's authorized replacement parts and supplies.

1. Perform maintenance, including emergency callback service, during normal working hours.

2. Include 24-hour-per-day, seven-day-per-week, emergency callback service.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION 08 33 23

SECTION 08 33 26

OVERHEAD COILING GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Open-curtain overhead coiling grilles.
2. Closed-curtain overhead coiling grilles.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for miscellaneous steel supports, angle-framing of grille opening, corner guards, and bollards.
2. Section 099113 "Exterior Painting" and Section 099123 "Interior Painting"] for finish painting of factory-primed grilles.

1.2 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling grille and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for curtain components, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies. Indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. For exterior components, include details of provisions for assembly expansion and contraction.
5. Show locations of controls, locking devices, and other accessories.
6. Include diagrams for power, signal, and control wiring.

C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.

1. Include similar Samples of accessories involving color selection.

D. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:

1. Open-curtain grille with full-size components consisting of rods, spacers, and links as

required to illustrate each assembly.
2. Closed-curtain grille with full-size components consisting of ribs and infill as required to illustrate each assembly.
3. Bottom bar with sensor edge.
4. Guides.
5. Mounting frame.
6. Brackets.
7. Hood.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For overhead coiling grilles to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

B. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design".

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of grilles that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain overhead coiling grilles from single source from single manufacturer.

1. Obtain operators and controls from overhead coiling-grille manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Overhead coiling grilles withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Component Importance Factor: 1.5.

2.3 OPEN-CURTAIN GRILLE ASSEMBLY

A. Open-Curtain Grille: Overhead coiling[, countertop] grille with a curtain having a network of horizontal rods that interconnect with vertical links.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Alumatec Pacific Products

B. Operation Cycles: Grille components and operators capable of operating for not less than [10,000][20,000][50,000][100,000][200,000]<Insert number>. One operation cycle is complete when a grille is opened from the closed position to the fully open position and returned to the closed position.

1. Include tamperproof cycle counter.

C. Grille Curtain Material: Stainless steel or Galvanized steel.

1. Rod Spacing: Approximately 1-1/2 inches o.c.
2. Link Spacing: Approximately 6 inchesstraight in-line]pattern.
3. Spacers: Metal tubes matching curtain material.

D. Bottom Bar: Continuous stainless steel and finished to match grille.

E. Curtain Jamb Guides: Stainless steel or Galvanized steelmatching curtain slats. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.Provide removable post(s) and jamb guides where indicated on Drawings.

F. Hood: Match curtain material and finish.

1. Shape: Round or Square.
2. Mounting: As indicated on Drawings
3. Locking Devices: Equip grille with locking device assembly.

G. Electric Grille Operator:

1. Usage Classification: Standard duty, up to 25 cycles per hour and up to 90 cycles per day.
2. Operator Location: As indicated on Drawings.
3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet or lower.
4. Motor Exposure: Interior.
5. Motor Electrical Characteristics:

a. Horsepower: ½ or 1 hp.
b. Voltage, Three Phase, 60 Hz: [208-V ac][230-V ac][460-V ac].

6. Emergency Manual Operation: Push-up and Chain type.
7. Obstruction-Detection Device: Automatic photoelectric sensor.

a. Sensor Edge Bulb Color: Black

8. Control Station: Where indicated on Drawings.
9. Other Equipment: Audible and visual signals, Emergency-egress releaseand Self-opening mechanism.

H. Curtain Accessories: Equip grille with push/pull handles.

I. Grille Finish:

1. Aluminum Finish: Anodized color as selected by Architect from full range of industry colors and color densities.
2. Baked-Enamel or Powder-Coat Finish: Color as selected by Architect from manufacturer's full range.

2.4 CLOSED-CURTAIN GRILLE ASSEMBLY

A. Operation Cycles: Grille components and operators capable of operating for not less than 100,000. One operation cycle is complete when a grille is opened from the closed position to the fully open position and returned to the closed position.

1. Include tamperproof cycle counter.

B. Grille Curtain Material: Aluminum ribs with continuous inserts indicated.

1. Rib Spacing: Approximately 3 inches o.c.

C. Bottom Bar: Continuous channel or doubled angles, fabricated from hot-dip galvanized steel or stainless steel and finished to match grille.

D. Curtain Jamb Guides: Aluminum with exposed finish matching curtain slats. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.

E. Hood: Match curtain material and finish.

1. Shape: As indicated on Drawings.
2. Mounting: As indicated on Drawings.

F. Locking Devices: Equip grille with locking device assembly.

G. Manual Grille Operator: [Push-up operation][Chain-hoist operator][Manufacturer's standard crank operator][Awning-crank operator][Wall-crank operator].

1. Provide operator with through-wall shaft operation.
2. Provide operator with manufacturer's standard removable operating arm.

H. Electric Grille Operator:

1. Usage Classification: Standard duty, up to 25 cycles per hour and up to 90 cycles per day.
2. Operator Location: As indicated on Drawings.
3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet or lower.

4. Motor Exposure: Interior
5. Motor Electrical Characteristics:

    a. Horsepower: ½ or 1 hp.

6. Emergency Manual Operation: Push-up and Chain.
7. Obstruction-Detection Device: Automatic photoelectric sensor.

    a. Sensor Edge Bulb Color: As selected by Architect from manufacturer's full range.

8. Control Station: Where indicated on Drawings.
9. Other Equipment: Audible and visual signals and Emergency-egress release].

I. Grille Finish:

1. Aluminum Finish: Anodized color as selected by Architect from full range of industry colors and color densities.
2. Baked-Enamel or Powder-Coat Finish: Color as selected by Architect from manufacturer's full range.

2.5 MATERIALS, GENERAL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.6 GRILLE CURTAIN MATERIALS AND CONSTRUCTION

A. Open-Curtain Grilles: Fabricate metal grille curtain as an open network of horizontal rods, spaced at regular intervals, that are interconnected with vertical links, which are formed and spaced as indicated and are free to rotate on the rods.

1. Aluminum Grille Curtain: ASTM B221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
2. Stainless Steel Grille Curtain: ASTM A666 or ASTM A240/A240M, Type 300 series.
3. Steel Grille Curtain: Hot-dip zinc coated (galvanized) complying with ASTM A123/A123M, or electrogalvanized complying with ASTM 653/A653M, and phosphatized before fabrication.
4. Glazing Insert: Manufacturer's standard glazing of clear polycarbonate sheet secured by the curtain links.

B. Closed-Curtain Grilles: Fabricate curtain as a series of horizontal double-C ribs, spaced at regular intervals, that alternate with continuous horizontal infill panels secured by the ribs.

1. Aluminum Horizontal Ribs: ASTM B221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
2. Glass Panels: Uncoated, clear, heat-treated, fully tempered float glass; complying with ASTM C1048, Condition A, Type I, Class I, Quality q3, Kind FT; manufacturer's standard panel dimensions and thickness.
3. Plastic Panels: Fire-retardant polycarbonate sheet manufactured by the extrusion process; UV resistant; manufacturer's standard panel dimensions and thickness.
4. Aluminum Panels: ASTM B209, alloy and temper standard with manufacturer for type of use and finish indicated; manufacturer's standard panel dimensions and thickness; finished to match ribs.

C. Bottom Bar: Manufacturer's standard continuous shape unless otherwise indicated, finished to match grille.

1. Astragal: Equip grille bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.
2. Provide motor-operated grilles with combination bottom astragal and sensor edge.

D. Grille Curtain Jamb Guides: Manufacturer's standard shape having curtain groove with return lips or bars to retain curtain. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise; with removable stops on guides to prevent overtravel of curtain.

1. Removable Posts and Jamb Guides: Manufacturer's standard.

2.7 HOODS AND ACCESSORIES

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

1. Galvanized Steel: Nominal 0.028-inch- thick, hot-dip galvanized-steel sheet with G90 zinc coating, complying with ASTM A653/A653M.
2. Stainless Steel: 0.025-inch- thick, stainless steel sheet, Type 304, complying with ASTM A666 or ASTM A240/A240M.
3. Aluminum: 0.040-inch- thick aluminum sheet, complying with ASTM B209, of alloy and temper recommended by manufacturer and finisher for type of use and finish indicated.

B. Removable Metal Soffit: Formed or extruded from same metal and with same finish as curtain if hood is mounted above ceiling unless otherwise indicated.

C. Mounting Frame: Manufacturer's standard mounting frame designed to support grille; factory fabricated from ASTM A36/A36M structural-steel [tubes][or][shapes], hot-dip galvanized per ASTM A123/A123M; fastened to floor and structure above grille; to be built into wall construction; and complete with anchors, connections, and fasteners.

D. Push/Pull Handles: Equip push-up-operated or emergency-operated grille with lifting handles on each side of grille, finished to match grille.

E. Pull-Down Strap: Provide pull-down straps for grilles more than 84 inches high.

F. Pole Hooks: Provide pole hooks and poles for grilles more than 84 inches high.

2.8 LOCKING DEVICES

A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.

B. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

1. Lock Cylinders: As specified in Section 087100 "Door Hardware" or standard with

manufacturer and keyed to building keying system.

2. Keys: Three for each cylinder.

C. Chain Lock Keeper: Suitable for padlock.

D. Safety Interlock Switch: Equip power-operated grilles with safety interlock switch to disengage power supply when grille is locked.

2.9 COUNTERBALANCE MECHANISM

A. General: Counterbalance grilles by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of parts and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.

C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.10 MANUAL GRILLE OPERATORS

A. General: Equip grille with manual grille operator by grille manufacturer.

B. Push-up Grille Operation: Lift handles and pull rope for raising and lowering grille, with counterbalance mechanism designed so that required lift or pull for grille operation does not exceed 25 lbf.

C. Chain-Hoist Operator: Consisting of endless steel hand chain, chain-pocket wheel and guard, and gear-reduction unit with a maximum 25-lbf force for grille operation. Provide alloy-steel hand chain with chain holder secured to operator guide.

D. Crank Operator: Consisting of crank and crank gearbox, steel crank drive shaft, and gear-reduction unit, of type indicated. Size gears to require not more than 25-lbf force to turn crank. Fabricate gearbox to be oiltight and to completely enclose operating mechanism. Provide manufacturer's standard crank-locking device.

2.11 ELECTRIC GRILLE OPERATORS

A. General: Electric grille operator assembly of size and capacity recommended and provided by grille manufacturer for grille and operation cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch,

control stations, control devices, integral gearing for locking grille, and accessories required for proper operation.

1. Comply with NFPA 70.
2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each grille.

C. Grille Operator Location(s): Operator location indicated for each grille.

1. Top-of-Hood Mounted: Operator is mounted to the right or left grille head plate, with the operator on top of the grille-hood assembly and connected to the grille drive shaft with drive chain and sprockets. Headroom is required for this type of mounting.
2. Front-of-Hood Mounted: Operator is mounted to the right or left grille head plate, with the operator on coil side of the grille-hood assembly and connected to the grille drive shaft with drive chain and sprockets. Front clearance is required for this type of mounting.
3. Wall Mounted: Operator is mounted to the inside front wall on the left or right side of grille and connected to grille drive shaft with drive chain and sprockets. Side room is required for this type of mounting. Wall-mounted operator can also be mounted above or below shaft; if above shaft, headroom is required.
4. Bench Mounted: Operator is mounted to the right or left grille head plate and connected to the grille drive shaft with drive chain and sprockets. Side room is required for this type of mounting.
5. Through-Wall Mounted: Operator is mounted on other side of wall from coil side of grille.

D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated for each grille assembly.

1. Electrical Characteristics: Minimum as indicated for each grille assembly. If not indicated, large enough to start, accelerate, and operate grille in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
2. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
3. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.

E. Limit Switches: Equip each motorized grille with adjustable switches interlocked with motor controls and set to automatically stop grille at fully opened and fully closed positions.

F. Obstruction-Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of grille opening. Activation of sensor immediately stops and reverses downward grille travel.

1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in grille opening without contact between grille and obstruction.

    a. Self-Monitoring Type: Designed to interface with grille operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, grille closes only with sustained or constant pressure on close button.

2. Electric Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control

circuit using manufacturer's standard take-up reel or self-coiling cable.

a. Self-Monitoring Type: Four-wire-configured device designed to interface with grille operator control circuit to detect damage to or disconnection of sensor edge.

3. Pneumatic Sensor Edge: Automatic safety sensor edge, located within astragal mounted to bottom bar. Contact with sensor activates device.

G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."

1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
2. Exterior-Mounted Units: Full-guarded, standard-duty, surface-mounted, weatherproof type; NEMA ICS 6, Type 4 enclosure, key operated.

H. Emergency Manual Operation: Equip electrically powered grille with capability for emergency manual operation. Design manual mechanism so required force for grille operation does not exceed 25 lbfe

I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

K. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with the accessibility standard.

L. Emergency-Egress Release: Flush, wall-mounted handle mechanism, for accessibility-code-compliant egress feature, not dependent on electric power. The release allows an unlocked grille to partially open without affecting limit switches to permit passage, and it automatically resets motor drive on return of handle to original position.

M. Self-Opening Mechanism: Automatic release mechanism triggered by fire alarm or power failure. When activated, the grille self-opens by means of a fail-safe operator to the fully open position without the need for power operation or battery backup systems.

2.12 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.13 ALUMINUM FINISHES

A. Mill Finish: Manufacturer's standard.

B. Clear Anodic Finish: AAMA 611, [AA-M12C22A41, Class I, 0.018 mm][AA-M12C22A31, Class II, 0.010 mm] or thicker.

C. Color Anodic Finish: AAMA 611, [AA-M12C22A42/A44, Class I, 0.018 mm][AA-M12C22A32/A34, Class II, 0.010 mm] or thicker.

D. Baked-Enamel or Powder-Coat Finish: AAMA 2603. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.14 STEEL AND GALVANIZED-STEEL FINISHES

A. Factory Prime Finish: Manufacturer's standard primer, compatible with field-applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

B. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

2.15 STAINLESS STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. Run grain of directional finishes with long dimension of each piece.
2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
3. Directional Satin Finish: No. 4.

C. Bright, Cold-Rolled, Unpolished Finish: No. 2B.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install overhead coiling grilles and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports, according to manufacturer's written instructions and as specified.

B. Install overhead coiling grilles, hoods, controls, and operators at the mounting locations

indicated for each grille.

C. Accessibility: Install overhead coiling grilles, switches, and controls along accessible routes in compliance with the accessibility standard.

3.3 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
3. Test grille opening when activated by detector, fire-alarm system, emergency-egress release, or self-opening mechanism as required. Reset grille-opening mechanism after successful test.

3.4 ADJUSTING

A. Adjust hardware and moving parts to function smoothly, so that grilles operate easily, free of warp, twist, or distortion.

1. Adjust exterior components to be weather resistant.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

3.5 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service is to include 12 months' full maintenance by skilled employees of coiling-grille Installer. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper grille operation. Parts and supplies are to be manufacturer's authorized replacement parts and supplies.

1. Perform maintenance, including emergency callback service, during normal working hours.
2. Include 24-hour-per-day, 7-day-per-week, emergency callback service.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling grilles.

END OF SECTION 08 33 26

SECTION 08 35 00
OVERHEAD DOORS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included: Provide doors specified including hardware, operating devices, and accessories for complete installation.

1.02 RELATED DOCUMENTS

A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are located in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

A. In accordance with Section 01 3000.

B. Substitutions will not be considered prior to the award of the General Contract.

1.04 GUARANTEE

A. Warranty provisions for Work under this Contract are specified in General Conditions. Supplementary to General Conditions, furnish written guarantee stating work is guaranteed to serve intended purpose under normal use and that defects in materials and workmanship within 1-year period after Contract substantial completion date will be repaired, replaced or made good at Contractor's expense.

PART 2 - PRODUCTS

2.01 INSULATED STEEL ROLLING DOORS

A. Provide "Stormtite" Model 625 doors face of wall mounted manufactured by Overhead Door Corp., Dallas, Texas, 1-800-887-3667, or approved equal.

B. Construct doors of interlocking rollformed slats Type F-265i filled with CFC-free, 2.2 lb. density foamed-in-place polyurethane.
1. Panel Thickness: 3/4"
2. Exterior of Slats: 24 ga., hot dipped galvanized.
3. Interior of Slats: 24 ga., hot dipped galvanized.
4. Springs: 50,000 cycles

C. Finish: PowderGuard® powder coat finish in Custom color to be selected by Architect.

D. Windload Design: ANSI/NAGDM 102 standards for 20 psf.

E. Lock Mechanism: Keyed cylinder with interlock switch at motor operated doors and chain keeper locks at chain operated doors.

F. Weatherstripping: Vinyl bottom seal, exterior and interior guide seals and lintel seals.

G. Track: Provide track as recommended by manufacturer to suit loading required and clearances available.

H. Electric Operation: Provide UL listed electric operator, Type ARHX@ and size recommended by manufacturer to move door in either direction at not less than 8" nor more than 12" per second.
1. Entrapment Protection: Photoelectric sensors.
2. Operation Controls: Push Button operated control stations with open, close and stop buttons for surface mounting at interior. Also, provide surface mounted key operated switch with open, close and stop positions where indicated at exterior of doors.

2.02 UN-INSULATED STEEL ROLLING DOORS

A. Provide Coil-Away Model 600 doors face of wall mounted manufactured by Overhead Door Corp., Dallas, Texas, 1-800-887-3667, or approved equal.

B. Construct doors of interlocking rollformed slats Type CAW
1. Thickness: 9/16"
2. Gage: 22 ga., hot dipped galvanized.
3. Springs: 50,000 cycles

C. Finish: PowderGuard® powder coat finish in Custom color to be selected by Architect.

D. Lock Mechanism: Keyed cylinder with interlock switch at motor operated doors

E. Track: Provide track as recommended by manufacturer to suit loading required and clearances available.

F. Electric Operation: Provide UL listed electric operator, Type "RG" as recommended by manufacturer to move door in either direction at not less than 8" nor more than 12" per second.
1. Entrapment Protection: Photoelectric sensors.
2. Operation Controls: Push Button operated control stations with open, close and stop buttons for surface mounting at interior. Also, provide surface mounted key operated switch with open, close and stop positions where indicated at exterior of doors.

2.03 COILING STORM SHUTTER

A. Provide Storm Defender Model PSD361 manufactured by The Cookson Company, or approved equal.

B. **Curtain: Steel with Finish as Described Below:** Minimum 12 gauge, ASTM A1008 or ASTM A1011 grade 40 steel

C. **Endlocks:**
1. Retention groove integrated into the body of the slat used to retain the slats within the guides.
2. 16 gauge aluminum secured with tabs integrated into the body of the slat used to restrain the slats in a horizontal position relative to one another.

D. **Bottom Bar:** 12G formed bottom bar profile with steel [stainless steel] strengthening insert

E. **Guides:** Minimum 1/4 inch (6.35mm) [structural steel] Top of inner and outer guide shapes to be flared outwards to form bellmouth for smooth entry of curtain into guides. Top 16 ½” (419.10 mm) of coil side guide shapes to be removable for ease of curtain installation and as needed for future curtain service.

F. **Counterbalance Shaft Assembly:**
1. **Barrel:** Steel pipe capable of supporting curtain load with maximum deflection of 0.03 inches per foot (2.5 mm per meter) of width
2. **Spring Balance:** Oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of door.
3. Provide tension wheel for applying and adjusting spring torque.

G. **Brackets:** Fabricate from minimum 3/8 inch (9.525 mm) steel plate with permanently lubricated ball or roller bearings at rotating support points to support counterbalance shaft assembly and form end closures

H. **Hood:** Minimum 24 gauge galvanized steel with reinforced top and bottom edges. Provide minimum 1/4 inch (6.35 mm) steel intermediate support brackets

I. **Finish: SpectraShield® Coating System:** Zirconium pre-treatment followed by baked-on polyester powder coat, with custom color as selected by Architect; minimum 2.5 mils (0.065 mm) cured film thickness; ASTM D-3363 pencil hardness: H or better

J. AlarmGard Plus Motor Operation with Chain Hoist and Battery Backup: UL, cUL listed NEMA 1 enclosure, horsepower as recommended by manufacturer. Provide a totally enclosed non ventilated motor, removable without affecting the setting of limit switches; thermal overload protection, planetary gear reduction, adjustable rotary limit switch mechanism and a transformer with 24v secondary output. All internal electrical components are to be prewired to terminal blocks.

K. **Sensing/Weather Edge: Electric sensing edge device:** Automatic sensing switch within neoprene or rubber astragal extending full width of door bottom bar. Contact before door fully closes shall cause door to immediately stop downward travel and automatically reverse direction to the fully opened position. Provide a wireless sensing edge connection to motor operator eliminating the need for a physical traveling electric cord connection between bottom bar sensing edge device and motor operator.

L. **Emergency Annunciator:** ADA compliant horn/strobe emergency annunciator to give advanced warning that door is about to close, activating warning signal upon alarm or activation.

M. **Battery Back-Up: Model R-BBU Battery Back-Up System for AlarmGard Motor Operator:** Prevent gravity closure for a minimum of four hours due to power failure.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine substrates and conditions under which overhead rolling doors are to be installed. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Install door and operating equipment, complete with necessary hardware, jamb and head mold strip, anchors, inserts, hangers, and equipment supports complying with final Shop Drawings, and manufacturer's installation instructions.

B. Lubricate, test, and adjust doors to provide easy operation, proper closing, and secure locking.

C. Instruct Owner in operation and maintenance of doors.

D. Touch up scuffs and abrasions in finish paint.

END OF SECTION

SECTION 08 40 00
ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.01 SCOPE

A. Provide aluminum doors and framing specified.

1.02 RELATED DOCUMENTS

A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are located in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

A. In accordance with Section 01 3000.

B. Substitutions will not be considered prior to the award of the General Contract.

1.04 QUALITY ASSURANCE

A. Fabricate exterior door and frame units to withstand the wind pressure loading shown or, or if not shown, 20 lbs. per sq. ft. on the gross area of the frames, doors, panels and glass, acting inward and also outward.

1.05 WARRANTY

A. Submit a warranty signed by the manufacturer, contractor, installer, agreeing to replace aluminum doors, windows, framing and glazing which fall in materials and workmanship within 2 years of the date of acceptance. Failure of materials or workmanship shall include, but not be limited to, failure in operation of doors, windows, and hardware, excessive leakage of air infiltration, excessive deflections, delamination of panels, deterioration of finish or metal in excess of normal weathering, and defect in accessories, weatherstripping, and other components of the work.
   1. Submit 10 year warranty by manufacturer of polyvinylidene fluoride (PVDF) coating.

B. Manufacturer's Product Warranty: Submit, for Owner's acceptance, manufacturer's warranty for entrance system as follows:
   1. Welded door corner construction shall be supported with a LIMITED LIFETIME WARRANTY for the life of the door under normal use. SEE SECTION 2.02, item C below for DOOR CONSTRUCTION.

1.06 ADJUSTMENT

A. After installation, make adjustments as necessary to insure proper operation of all hardware items.

B. Door Opening Force: In accordance with the Americans With Disabilities Act (ADA), adjust all door hardware so that the maximum force required for pushing or pulling open a door shall be as follows:
   1. Fire doors shall have the minimum opening force allowable by the appropriate administrative authority.
   2. Exterior hinged doors: 8.5 lbf (SBS)
   3. Interior hinged doors: 5.0 lbf
   4. These forces do not apply to the force required to retract latch bolts or disengage other devices that may hold the door in a closed position.

C. Door Closers: If door is equipped with a closer, then the sweep period of the closer shall be adjusted so that from an open position of 70 deg., the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers who produce products that may be submitted to Architect for review are:
1. Kawneer
2. Oldcastle BE
3. EFCO
4. Tubelite

2.02 SWINGING GLASS DOORS

A. Material Standard: ASTM B 221; 6063-T6 alloy and temper.

B. The door stile and rail face dimensions of the 350 entrance door will be as follows:
1. Vertical Stile: 3-1/2”
2. Top Rail: 3-1/2”
3. Bottom Rail: 10”

C. Entrance System Fabrication:
1. Door corner construction shall consist of mechanical clip fastening, SIGMA 1-1/8” long fillet welds along top and bottom of rail extrusion at stile and rail intersection, and deep penetration plug weld at all four corners of door. Must be full penetration plug weld to leg of clip, 1-1/8” long fillet welds along top and bottom or rails at stiles intersection, no tie-rod construction of any type or partial design allowed. Meeting rail to still joint fillet weld “only” is NOT ACCEPTABLE. Glazing stops shall be hook-in type with EPDM glazing gaskets reinforced with non-stretchable chord.

D. Refer to Section 08 7000 for Hardware.

2.03 FRAMING

A. Door, Storefront, and Windows: Provide standard shapes and moldings of Kawneer glazed framing system, or approved equal.
1. Trifab VG 451T at exterior
2. Trifab VG 450 at interior

B. Subsill: Manufacturer's standard High-Performance (HP) subsill with sealed end-dams.

C. Storefront System Performance Requirements:
1. Air Infiltration: The test specimen shall be tested in accordance with ASTM E 283. Air infiltration rate shall not exceed 0.06 cfm/ft^2 at a static air pressure differential of 6.24 psf (300 Pa).), with interior perimeter seal installed.
2. Water Resistance: The test specimen shall be tested in accordance with ASTM E 331. There shall be no leakage at a minimum static air pressure differential of 10 psf (383 Pa) as defined in AAMA 501.
3. Uniform Load: A static air design load of 20 psf shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of L/175 of the span of any framing member. At a structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.
4. Thermal Transmittance (U-factor): When tested to AAMA Specification 1503, the thermal transmittance (U-factor) shall not be more than: 0.44 (low-e) or 0.61 (clear), as determined by AAMA 507 or NFRC 100.

2.04 ALUMINUM FLASHING AND BREAKMETAL

A. Provide 0.040 thick material for flashing and 0.090 material for break metal.

2.05 SEALANTS

A. Shop Applied: Provide GE Silpruf or Dow Corning 795 shop applied silicone sealant, or approved equal.

B. Field Applied:
1. Structural sealant for glazing perimeter shall be GE SSG Ultra Glaze, Dow Corning 995, or approved equal.
2. For soft joints adjacent to Architectural Precast Concrete and Cast Stone products, use Tremco, Inc., Spectrem 3, Single-Component, Nonsag, Non-Staining, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, Use NT.
3. For other joints, select an appropriate sealant for the type of joint, movement and substrates involved. Acceptable products include Tremco Dymeric, GE 1200, Dow Corning 999, GE Silpruf, Dow Corning 795, Tremco Curtainwall Sealant, Dow Corning 790, PTI 606 Butyl Tape, Tremco Polyshim Tape, or approved equal.

2.06 FINISH

A. Factory finish with oven cured Kynar 500 based polyvinylidene fluoride (PVDF) coating, AAMA 2605 70% resin formulation in Custom Color to be selected by Architect.
1. Dry Film Thickness, ASTM D1400: 0.20 mil primer coat plus 1.0 mil color coat, 1.20 mil total, minimum thickness.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in compliance with manufacturer's recommendations and accepted shop drawings. Set units plumb, level and true to line, without warp or rack of framing, windows, and doors. Anchor securely in place. Secure to structure with non-staining, non-corrosive shims, anchors, fasteners, spacers, and fillers. Use care in erection so as not to mar, abrade, or stain finished surfaces. Where aluminum is to be placed in contact with steel, concrete and other dissimilar surface, back paint the aluminum before erection with an acceptable bituminous paint.

B. Seal frames with a Silicone approved sealant in color to match frames, making a neat fully weatherproof job. Refer to Section 07 9000, and comply with requirements of that section.

C. Protection: After erection, adequately protect by masking, light motor oil, vaseline or other acceptable covering all exposed parts of the work and the finish from damage by grinding and polishing machines and/or by plaster, lime, cement, acid or other harmful substances.

D. Cleaning: After completion of all other work in the vicinity of the aluminum doors, windows, and framing, remove all masking, vaseline and/or other covering used to protect the work, and thoroughly clean the aluminum surfaces with soap and plain water or a petroleum product such as white gasoline, kerosene, or distillate. Do not use abrasive cleaning agents.

END OF SECTION

SECTION 08 40 50
GLAZED CURTAIN WALLS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included: Furnish and install aluminum curtain wall with glass specified.

B. It is the curtain wall manufacturer's responsibility to perform the following:
   1. Design and provide all curtain wall support brackets, attachments and support steel as necessary to fully support all curtain wall systems as required by drawings and specifications.
   2. Design and provide expansion and contraction capabilities for all curtain wall system.

1.02 RELATED DOCUMENTS

A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are located in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

A. In accordance with Section 01 3000.
   1. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
   2. Shop Drawings: For glazed aluminum curtain walls. Include plans, elevations, sections, full-size details, and attachments to other work.
   3. Samples for Initial Selection: For units with factory-applied color finishes.
   4. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
   5. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified preconstruction testing agency, for glazed aluminum curtain walls, indicating compliance with performance requirements.
   6. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed curtain wall systems, made from 12" (304.8 mm) lengths of full-size components and showing details of the following:
      a. Joinery
      b. Glazing

B. Substitutions will not be considered prior to the award of the General Contract.

1.04 PRODUCT HANDLING

A. Protection: Protect curtain wall components, glass, and glazing materials before, during, and after installation. Protect installed work and materials of other trades.

B. Replacements: In event of damage, immediately make repairs and replacements necessary to approval of Architect and at Contractor's expense.

1.05 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by testing of glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
   1. Glazed aluminum curtain walls shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and

deflection from uniformly distributed and concentrated live loads. Failure also includes the following:

a. Thermal stresses transferring to building structure.
b. Glass breakage.
c. Loosening or weakening of fasteners, attachments, and other components.
d. Failure of operating units.

B. Delegated Design: Design glazed aluminum curtain walls, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Wind loads: Provide Curtain Wall system; include anchorage, capable of withstanding wind load design pressures based on the IBC Building Code; Current Adopted Edition

D. Air Infiltration: The test specimen shall be tested in accordance with ASTM E 283. Air infiltration rate shall not exceed 0.06 cfm/ft^2 (0.3 l/s · m^2) at a static air pressure differential of 6.24 psf (300 Pa).

E. Water Resistance, (static): The test specimen shall be tested in accordance with ASTM E 331. There shall be no leakage at a static air pressure differential of 12 psf (575 Pa) as defined in AAMA 501.

F. Water Resistance, (dynamic): The test specimen shall be tested in accordance with AAMA 501.1. There shall be no leakage at an air pressure differential of 12 psf (575 Pa) as defined in AAMA 501.

G. Uniform Load: A static air design load of 40 psf (1915 Pa) shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of L/175 of the span of any framing member at design load. At structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.

1.06 QUALITY ASSURANCE

A. Installer must be a single firm with not less than 5 years of successful experience in erection of stock systems similar to systems required for this project.

1.07 WARRANTY

A. Submit written warranty agreeing to repair or replace defective materials and workmanship during the warranty period as follows:
1. General Warranty period is two (2) years from date of final acceptance.
2. Submit 10 year warranty on fluorocarbon finish system.
3. Submit 5 year warranty on anodized finish.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Basis of design is Kawneer 1600 System 2 SSG. Alternate manufacturers who produce products that may be submitted to Architect for review are:
1. Oldcastle BE Reliance Wall
2. EFCO 5600
3. Tubelite

2.02 MATERIALS

A. Material Standard: Extruded Aluminum, ASTM B 221, 6063-T6 alloy and temper.

B. Member Wall Thickness: Each framing member shall have a wall thickness sufficient to meet the

specified structural requirements.

C. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of curtain wall members are nominal and in compliance with AA Aluminum Standards and Data.

D. Fasteners: Where exposed, shall be Stainless Steel.

E. Gaskets: Glazing gaskets shall comply with ASTM C 864 and be extruded of a silicone compatible EPDM rubber that provides for silicone adhesion.

F. Perimeter Anchors: Aluminum. When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

G. Thermal Barrier: Thermal separator shall be extruded of a silicone compatible elastomer that provides for silicone adhesion.

2.03 FINISHES

A. Factory finish with oven cured Kynar 500 based polyvinylidene fluoride (PVDF) coating, AAMA 2605 70% resin formulation in Custom Color to be selected by Architect.
1. Dry Film Thickness, ASTM D1400: 0.20 mil primer coat plus 1.0 mil color coat, 1.20 mil total, minimum thickness.

2.04 GLAZING MATERIALS

A. Gaskets and Weatherstrips except at Structural Silicone Glazing:
1. Provide sponge gaskets of extruded black neoprene with a Shore A hardness of 40 conforming to ASTM C509. Gaskets to allow 20-35% compression.
2. Provide dense gaskets of extruded black neoprene with a Shore A hardness of 75 for hollow profiles and 60 for solid profiles and conforming to NAAMM SG-1-70.

B. Gaskets at Structural Silicone Glazing: Provide black, non-cured silicone rubber. Use Type 1 where adhesion is not desired and Type 2 where adhesion is desired.

C. Setting Blocks:
1. Provide black solid extruded neoprene with a Shore A hardness of 85, minimum length of 4" and a minimum width corresponding to the glass thickness. Locate at quarter points.
2. Extruded silicone setting blocks are required where in contact with silicone sealant.
3. Shims are to be of same material, hardness, length and width as setting blocks.

D. Side Blocks:
1. Locate side blocks within upper half of each jamb for each light. Blocks shall have Shore A hardness of 55 and shall be solid neoprene. Install with 1/8" clearance between block and bearing surface.
2. Side blocks are not required when an individual glass light is continuously sealed with silicone at two or more edges.

E. Lockstrip Gaskets:
1. Lockstrip gaskets shall be spline-type extruded black neoprene with a Shore A hardness of 75 and conforming to ASTM C542.
2. Lip seal pressure shall be a minimum of 4 lb./linear inch and a maximum of 10 lb./linear inch.
3. Prior to installing the locking strip, apply a perimeter bead of silicone sealant between the inside surface of the glass and the lockstrip gasket.

2.05 MISCELLANEOUS MATERIALS

A. All screws, bolts, nuts, washers and rivets shall be 300 Series, non-magnetic stainless steel or cadmium plated steel.

B. Provide lock washer or other locking device at all bolted connections.

C. All hot rolled steel shapes and plates shall conform to ASTM A26.

D. Provide weep hole filters of 45 pore/inch, open cell, urethane foam compressed 30-50%.

2.06 SEALANTS

A. Shop Applied: Provide GE Silpruf or Dow Corning 795 shop applied silicone sealant, or approved equal.

B. Field Applied:
1. Structural sealant for glazing perimeter shall be GE SSG Ultra Glaze, Dow Corning 995, or approved equal.
2. For soft joints adjacent to Architectural Precast Concrete and Cast Stone products, use Tremco, Inc., Spectrem 3, Single-Component, Nonsag, Non-Staining, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, Use NT.
3. For other joints, select an appropriate sealant for the type of joint, movement and substrates involved. Acceptable products include Tremco Dymeric, GE 1200, Dow Corning 999, GE Silpruf, Dow Corning 795, Tremco Curtainwall Sealant, Dow Corning 790, PTI 606 Butyl Tape, Tremco Polyshim Tape, or approved equal.

2.07 ALUMINUM FLASHING AND BREAKMETAL

A. Provide 0.040 thick material for flashing and 0.080 material for breakmetal.

B. Finish: Factory finish with oven cured Kynar 500 based polyvinylidene fluoride (PVDF) coating, AAMA 2605 70% resin formulation in Custom Color to be selected by Architect.
1. Dry Film Thickness, ASTM D1400: 0.20 mil primer coat plus 1.0 mil color coat, 1.20 mil total, minimum thickness.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install complete with components set plumb, square, level, at their proper elevation and plane, and located in proper alignment with all work. Protect exposed aluminum from damage by grinding and polishing machines, lime, acid, cement, and harmful compounds.

B. Erection Tolerances: Adjust work to conform with the following tolerances.
1. Plumb: 1/8" in 10'; 1/4" in 40'.
2. Level: 1/8" in 20'; 1/4" in 40'.
3. Limit offset of member alignment to 1/16" where surfces are flush or less than 1/2" out of flush and seperated by less than 2"; otherwise limit offsets to 1/8".
4. Location: 3/8" maximum deviation from measured theoretical location.

C. Firestopping "Safing" Insulation: Clean debris from behind window wall during erection and provide temporary closures to prevent accumulation. Install firestopping to comply with governing regulations and with AAMA RI-A3. Install firestopping with securely anchored metal flanges or equivalent provisions to prevent dislocation.

D. General: Install curtain wall systems plumb, level, and true to line, without warp or rack of frames with manufacturer’s prescribed tolerances and installation instructions. Provide support and anchor in place.
1. Dissimilar Materials: Provide separation of aluminum materials from sources of corrosion or electrolytic action contact points.

2. Glazing: Glass shall be outside glazed and held in place with extruded aluminum pressure plates anchored to the mullion using stainless steel fasteners spaced no greater than 9" (228.6) on center.
3. Water Drainage: Each light of glass shall be compartmentalized using joint plugs and silicone sealant to divert water to the horizontal weep locations. Weep holes shall be located in the horizontal pressure plates and covers to divert water to the exterior of the building.

E. Related Products Installation Requirements:
1. Sealants (Perimeter): Refer to Joint Treatment (Sealants) Section.
2. Glass: Refer to Glass and Glazing Section.
a. Reference: ANSI Z97.1, CPSC 16 CFR 1201 and GANA Glazing Manual.

3.02 FIELD QUALITY CONTROL

A. Testing Agency Field Service: Engage a qualified independent testing agency to perform field quality control. Materials and installation failing to meet specified requirements shall be replaced at Contractor's expense. Retesting of materials and installations failing to meet specified requirements shall be done at Contractor's expense.

B. Water Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.

C. Test performed as early as possible on initially installed framing unit of Architects selection to determine correction of installation.
1. Test Area: One (1) 20' X 20' area as directed by the Architect.

3.03 ADJUSTING, CLEANING AND PROTECTION

A. Protection: Protect installed product's finish surfaces from damage during construction. Protect aluminum curtain wall system from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants.

B. Cleaning: Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.

C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION

SECTION 08 41 26
ALL-GLASS ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Interior all-glass airlock system consisting of manual-swinging all-glass entrance doors and storefront.
   2. Interior all-glass office front system consisting of manual-swinging all-glass entrance doors and storefront.

1.02 DEFINITIONS

A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."
B. Airlock System: When used “Airlock” or “Airlock System” shall refer to industry standard all-glass entrance and storefront assemblies.

1.03 PERFORMANCE REQUIREMENTS

A. General Performance: All-glass systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction.
   1. Movements of supporting structure indicated on Drawings including, but not limited to, deflection from uniformly distributed and concentrated live loads.
   2. Dimensional tolerances of building frame and other adjacent construction.
   3. Failure includes the following:
      a. Deflection exceeding specified limits.
      b. Thermal stresses transferring to building structure.
      c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
      d. Noise or vibration created by thermal and structural movements.
      e. Loosening or weakening of fasteners, attachments, and other components.
      f. Failure of operating units.
B. Structural Performance: All-glass systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to SEI/ASCE 7.
   2. Deflection Limits:
      a. Deflection normal to glazing plane is limited to 1/2 inch for an entrance and storefront assembly height of 10’-6” with use of two mall clamps at each butt joint to achieve minimum deflection.
      b. Deflection of any framing member in a direction normal to the plane of the wall when subjected to the full code required wind loads specified above shall not exceed 1/175 of its clear span or 3/4 inch whichever is less, except limit deflection of glass to 1 inch.
C. Delegated Design: Design all-glass systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

D. Thermal Movements: Allow for thermal movements resulting from the following ambient and surface temperature changes.
   1. Temperature Change (Range): **120 deg F, ambient; 180 deg F, material surfaces**

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for all-glass system.
B. Shop Drawings: Show fabrication and installation details, including the following:
   1. Plans, elevations, and sections.
   2. Details of fittings and glazing, including isometric drawings of patch and rail fittings.
   4. Door hardware locations, mounting heights, and installation requirements.
C. Samples for Verification: For each type of exposed finish required, provide Three (3) samples prepared on Samples of size indicated below.
   1. Metal Finishes: 6-inch- long sections of patch and rail fittings, accessory fittings, and other items.
   2. Glass: 6 inches square, showing exposed-edge finish.
   3. Door Hardware: For exposed door hardware of each type, in specified finish, full size.
D. Other Action Submittals:
   1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, sidelights, transoms, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.
E. Delegated-Design Submittal: For all-glass systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   1. Detail fabrication and assembly of all-glass systems.
   2. Include design calculations.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.
B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for all-glass systems.
C. Warranty: Sample of special warranty.

1.06 CLOSEOUT SUBMITTALS

A. Maintenance Data: For all-glass systems to include in maintenance manuals.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
B. Engineering Responsibility: Prepare data for all-glass systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.

C. Source Limitations: Obtain all-glass systems from single source from single manufacturer.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
   1. Build mockups for all-glass systems including entrance door hardware, patch and rail fittings, and accessory fittings.
      a. Size: As directed by Architect.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Preinstallation Conference: Conduct conference at Project site.

1.08 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with all-glass systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.09 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of all-glass systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including excessive deflection.
      b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
      c. Failure of operating components.
   2. Warranty Period: Two years from date of Substantial Completion, except as follows:
      a. Concealed Floor Closers: 25 years from date of Substantial Completion.

1.10 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of all-glass system Installer. Include quarterly preventive maintenance, repair, or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper all-glass system operation. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Glass: Fully tempered, ASTM C1048, Condition A, Type 1, transparent, Class 1, Quality Q3, unless otherwise indicated.
   1. Impact Strength: Category II, tested in accordance with 16 CFR 1201.
   2. Thickness: 1/2 inch.
   3. Configuration: As indicated on drawings.
   4. Edges: Ground smooth and polished.
   5. Color: Clear, no tint.

B. Stainless Steel Sheet, Strip, Plate, and Flat Bar: ASTM A 666, Type 304.
C. Single-Component, Nonsag, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Uses NT, G, and A.

1. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L.

2.02 METAL COMPONENTS

A. Fitting Configuration:
1. Vestibule:
a. Manual-Swinging, All-Glass Doors: Patch fitting at top and continuous rail fitting at bottom.
b. All-Glass Storefronts: Continuous top and bottom rail fittings.
2. Offices:
a. Manual-Swinging, All-Glass Doors: Continuous top and bottom rail fittings. b. All-Glass Storefronts: Continuous top and bottom rail fittings.
B. All-glass Assemblies with Manual Swing Doors: Subject to compliance with requirements, provide products by one of the following Manufactures:
1. Manufacture: C.R. Laurence Co. Inc.
a. Door Fittings and Rails for Monolithic Glazing:
1) Top Door Patch Fitting: Model No. “PH20AA” patch fitting with aluminum finish.
a) Pivot Insert: Model No. “1NT303” pivot insert.
2) Top Door Rails without Locks: Model No. “DR2SSA12S” door rail with satin anodized finish.
a) Height: 2-5/16-inch.
b) Pivot Insert: Model No. “1NT703” pivot insert.
3) Bottom Door Rails without Locks: Model No. “DR10SSA12S,” door rail with satin anodized finish.
a) Height: 10 inch.
b) Lock: Refer and coordinate with Division 08 Section "Door Hardware" for hardware type.
c) Floor Closer Arm: Model No. “CRL9040AS” short center-hung floor closer arm.
c. Sidelite Railings for Monolithic Glazing:
1) Top Sidelite Rails with Saddle:
a) For 1/2-inch Glazing: Model No. “SR2SSA12SL” 2-5/16-inch high rails with satin anodized finish.
2) Bottom Sidelite Rails with Saddle:
a) For 1/2-inch Glazing: Model No. “SR4SSA3812CL” 4-inch high rails with satin anodized finish.
3) End Caps: Manufacturer's standard precision-fit end caps for rail fittings.
e. Pivots and Accessories:

1) Center-Hung Top Pivot: Model No. “CRL9040WBP” walking beam top pivot with brushed stainless steel finish.
a) Custom Cover Plate: Provide manufacturers custom cover plate of same finish as patch fittings size as selected by Architect to span full length of door opening.
2) Top Center Swing Door Pivot: Model No. “1NT401” top center hung free swing pivot with brushed stainless steel finish.

3) 180 Degree Square Mall Front Clamp: Model No. “MFC19” clamp with brushed stainless steel finish.
4) Shallow U-Channel: Model No. “WU3SASL” channel with satin anodized finish.
a) Accessories: Provide matching end caps.

2. Manufacture: Doralco Architectural Metals.

a. Door Fittings and Rails:

1) Top Door Patch Fitting: Provide “Slimline Patch” 2-inch high door patch fitting with clear anodized finish for 1/2-inch thick glazing.
a) Pivot Insert: Provide pivot inserts compatible with specified pivot.
2) Top Door Rails without Locks: Provide “3 3/8-inch Sure-Grip” door rail customized to a 2-5/16-inch high rail with clear anodized finish for 1/2-inch thick glazing.
a) Pivot Insert: Provide pivot inserts compatible with specified pivot.
3) Bottom Door Rails without Locks: Provide “Sure-Grip” 10-inch high door rail with clear anodized finish for 1/2-inch thick glazing.
a) Lock: Refer and coordinate with Division 08 Section "Door Hardware" for hardware type.
b) Floor Closer Arm: Provide center-hung floor closer arm that is compatible with floor closer.

b. Sidelite Railings:
1) Top Sidelite Rails with Saddle:
a) For 1/2-inch Glazing: Provide “Previnyled Sidelite Rail” 3-3/8-inch high rail customized to 2-5/16-inch high rail with clear anodized finish.
2) Bottom Sidelite Rails with Saddle: Provide 4-inch Previnyled Sidelite Rail for 1/2-inch thick glazing with clear anodized finish.
3) End Caps: Manufacturer's standard precision-fit end caps for rail fittings.

c. Accessories: Provide all-glass manufacturer’s standard accessories and compatible components to door hardware components specified in Division 08 Section "Door Hardware." Provide accessories shall include but not limited to the following:
1) Center-Hung Top Pivot: Provided all-glass manufacturer’s standard recessed mounted top center swing door pivot of brushed stainless steel finish.
a) Custom Cover Plate: Provide manufacturers custom cover plate of same finish as patch fittings size as selected by Architect to span full length of door opening.
surface mounted top center swing door pivot of brushed stainless steel finish.
3) Square Mall Front Clamp: 2-inch by 2-inch, square mall front clamp with brushed stainless steel finish for use with glazing thicknesses specified.
4) Shallow U-Channel: 1-inch high channel of depth to accommodate specified glazing thickness with clear anodized finish.
a) Accessories: Provide matching end caps.

1) Accessories: Provide matching end caps.

2.05 FABRICATION

A. Provide holes and cutouts in glass to receive hardware, fittings, and accessory fittings before tempering glass. Do not cut, drill, or make other alterations to glass after tempering.
1. Fully temper glass using horizontal (roller-hearth) process, and fabricate so tat when

glass is installed, roll-wave distortion is parallel with bottom edge of door or lite.

B. Factory assemble components and factory install hardware and fittings to greatest extent possible.

C. Entrance Door and Frame Assembly General: Fabricate the entrances to the designs, shapes, and sizes shown using the materials specified and shown to produce assemblies that meet or exceed the performance requirements. To the greatest extent possible complete fabrication, assembly, finishing, hardware applications and other work before shipment to Project site.
   1. Doors and frames shall be cut, reinforced, drilled and tapped in strict accordance with the printed door hardware manufacturer's templates and instructions. Provide solid stainless steel hardware reinforcements, securely fastened to doors and frames where door hardware is to be attached.
      a. Security system components may be incorporated into the door and frame openings of all entrance doors and frames. Provide all cutouts required by the Owner's security system vendor and all prewiring for vendor provided security system devices. Wherever entrance framing components are to receive wiring provide unobstructed clear paths free of burrs and sharp objects with pull strings to facilitate wiring.
   2. Joints in Metal Work: All exposed work shall be carefully fitted and matched to produce continuity of line and design, with all joints, being accurately fitted for hairline contact and rigidly secured. Where additional rigidity or strength is required to satisfy the performance requirements reinforce entrance components with aluminum or carbon steel shapes, bars, and plates.

D. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
   1. Profiles that are sharp, straight, and free of defects or deformations.
   2. Accurately fitted joints with ends coped or mitered.
   3. Physical and thermal isolation of glazing from framing members.
   4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
   5. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

E. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
   1. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

G. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

H. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

I. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

J. Shop Assembly: As far as practicable, all fitting and assembly work shall be done in a fabrication shop.

K. Exposed Fasteners: Not permitted.

L. Protection of Metals: Wherever dissimilar metals are in contact, except in the case of aluminum in contact with galvanized steel, zinc, separate such surfaces with a coating of zinc rich primer, bituminous paint, or separation gaskets as the condition requires. Wherever aluminum comes in contact with concrete surfaces separate such surfaces with a coating of zinc rich primer, bituminous paint, or separation gaskets as the condition requires.

2.06 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate entrance and storefront work with the work of other Sections and provide items to be placed during the installation of other work at the proper time to avoid delays in the work.
B. Templates and Diagrams: Furnish templates, diagrams, and other data to fabricators and installers of related work, as necessary for coordinating entrance and storefront installation.
C. Place such items, including concealed overhead framing, accurately in relation to the final location of entrance and storefront components.

3.02 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.03 INSTALLATION

A. Install all-glass systems and associated components according to manufacturer's written instructions.
C. Entrance Doors: Doors shall be securely anchored in place to a straight, plumb and level condition, without distortion. Adjust doors to provide a tight fit at contact points for weathertight closure and to operate smoothly, without binding, with hardware functioning properly. Hardware movement shall be field tested and final adjustment, and lubrication, made for proper operation and performance of doors.
   1. Door Hardware: Refer to Division 08 Section "Door Hardware."

D. Set units level, plumb, and true to line, with uniform joints.

E. Maintain uniform clearances between adjacent components.
F. Lubricate hardware and other moving parts according to manufacturer's written instructions.

G. Set, seal, and grout floor closer cases as required to suit hardware and substrate indicated.

H. Install joint sealants as specified in Division 07 Section "Joint Sealants".

3.04 ADJUSTING AND CLEANING

A. Adjust all-glass entrance doors and hardware to produce smooth operation and tight fit at contact points and weather stripping.
   1. For all-glass entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch measured to the leading door edge.
B. Remove excess sealant and glazing compounds and dirt from surfaces.

END OF SECTION 08 4126

SECTION 08 56 53
SECURITY WINDOWS
(TELLER AND SERVICE WINDOWS)

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Exterior and interior window units.
2. Bullet resistant exterior and interior security pass, service and teller window units.
3. Glazing.
4. Air curtains.
5. Intercom and talk through.

B. Related Sections:
1. Section 04 20 00 - Unit Masonry, 04 20 10 CMU, 04 81 00 Unit Masonry Assemblies.
2. Section 05 40 00 - Cold Formed metal Framing.
3. Section 06 10 00 - Rough Carpentry.
4. Section 07 62 00 - Sheet Metal Flashing And Trim.
5. Section 07 92 00 - Joint Protection
6. Section 08 41 13- Aluminum-Framed Entrances And Storefronts.
7. Section 09 21 16 - Gypsum Board Assemblies.
8. Electrical Requirements Division 26.

1.2 REFERENCES

A. American Architectural Manufacturers Association:
1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
2. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.

B. American Society Mechanical Engineers Standards:
1. ASME SA-240/SA-240M - Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

C. ASTM International:
1. ASTM A27/A27M - Standard Specification for Steel Castings, Carbon, for General Application.
2. ASTM A 36/A 36M. - Standard Specification for Carbon Structural Steel.
3. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings.
4. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
5. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
6. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.

7. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
9. ASTM B221/B221M - Standard Specification for Aluminum and AluminumAlloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
10. ASTM C1036 - Standard Specification for Flat Glass.
11. ASTM C1048 - Standard Specification for Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass.
12. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
13. ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics.
14. ASTM E488 - Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements.
15. ASTM E699 - Standard Practice for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating of Building Components.
16. ASTM E2188 - Standard Test Method for Insulating Glass Unit Performance.
17. ASTM E2189 - Standard Test Method for Testing Resistance to Fogging in Insulating Glass Units.
18. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.
19. ASTM F588 - Standard Test Methods for Resistance of Window Assemblies to Forced Entry Excluding Glazing.
20. ASTM F2329 - Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.

D. California Model Building Security Ordinance:

1. CMBSO - Section 15.52.100, Tests CAWM 301-90, Forced Entry Resistance Tests for Windows.

E. Consumer Products Safety Commission:
   1. CPSC 16 CFR 1201 - Safety Standard for Architectural Glazing.

F. CSA International - Canadian Standards Association:
   1. CAN/CSA C22.2 No. 68-92 - Motor-Operated Appliances (Household and Commercial).
   2. CAN/CSA C22.2 No. 247- Operators and Systems of Doors, Gates, Draperies and Louvers.

G. DuPont Powder Coating Test Method:
   1. DPC TM 10.219 - PCI Powder Smoothness.

H. Florida Building Code:
   1. Static Air Pressure Test.

I. H.P. White Laboratory, Inc.:
   1. HPW-TP0500.01:
      a. Level V.
      b. Level C Ballistics (.44 magnum).
   2. HPW-TP-0500.02 - Level B Ballistics (9mm).

J. National Association of Architectural Metal Manufacturers.

1. NAAMM No. 3 Finish: Ground unidirectional uniform finish obtained with 80 - 100 grit abrasive.

K. SAE International:
   1. AMS5511 - Steel, Corrosion-Resistant, Sheet, Strip, and Plate, 19Cr - 9.5Ni (304L), Solution Heat Treated.
   2. AMS5513 - Steel, Corrosion-Resistant, Sheet, Strip, and Plate 19cr 9.2Ni (SAE 30304) Solution Heat Treated.

L. Steel Structures Painting Council:
   1. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).

M. Underwriters Laboratory:
   1. UL 73 - Motor-Operated Appliances.
   2. UL 325 - Door, Drapery, Gate, Louver, and Window Operators and Systems.
   3. UL 752 - Ballistic Standards:
      a. Level I MPSA 9mm.
      b. Level III SPSA .44 Magnum.
   4. UL 1995 - Heating and Cooling Equipment.

1.3 PERFORMANCE REQUIREMENTS

A. System Design:

1. Design and size components to withstand dead loads and live loads caused by pressure and negative wind loads acting normal to plane of window as calculated in accordance with applicable code.

B. System Internal Drainage: Drain water entering joints, condensation occurring in glazing channels, and migrating moisture occurring within system, to exterior by weep drainage network.

C. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with [inside] pane of glass and heel bead of glazing compound. [Position thermal insulation on exterior surface of air barrier and vapor retarder.]

D. Ballistics-Resistance Performance: Provide units identical to those tested for compliance with requirements indicated, and as follows:
   1. Listed and labeled as bullet resisting according to UL 752.

E. Forced-Entry-Resistance Performance: Provide units identical to those tested for compliance with requirements indicated, and as follows:
   1. Tested for forced-entry resistance according to ASTM F588 by a testing agency acceptable to authorities having jurisdiction.

F. Provide glass and glazing materials for continuity of building enclosure vapor retarder and air barrier:

1. To utilize the inner pane of multiple pane sealed units for the continuity of the air barrier and vapor retarder seal.

G. Structural Design: Design glass and glazing in accordance with applicable code for most critical combination of wind, snow, seismic, and dead loads.

H. Electrical Requirements:
   1. Motor operated to comply with CAN/CSA C22.2 No. 68-92 and UL 73.

2. Operators and systems for doors, gates, and window operators to comply with CAN/CSA C22.2 No. 247 and UL 325.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures {01330 - Submittal Procedures}: Requirements for submittals.

B. Shop Drawings:
1. Indicate configuration, sizes, rough-in, mounting, construction and glazing details as well as installation clearances and finishes.

C. Product Data:
1. Submit manufacturer's product data for specified Products indicating materials, operation characteristics, and finishes.

D. Samples:
1. Submit two samples, 4 x 4 inches (100 x 100 mm) in size illustrating metal finishes for each finish specified.

E. Test Reports:
1. [Indicate compliance with specified bullet resistance performance.]

F. Manufacturer's Installation Instructions:
1. Submit installation instructions with requirements to accommodate specific site conditions.

1.5 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by UL or testing firm acceptable to authority having jurisdiction.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum 10 years documented experience.
1. Participates in a Quality Assurance validation Program.
a. Facility Audit.

B. Installer: Company specializing in installation of window systems specified with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Section 01 60 00 - Product Requirements {01600 - Product Requirements}: Requirements for transporting, handling, storing, and protecting products.

B. Ordering: To avoid construction delays comply with ordering instructions and lead time requirements as set by window system manufacturer.

C. Pack window units in manufacturer's standard shipping containers and protective packaging. Deliver units in manufacturer's original packaging and unopened containers with identification labels intact.

D. Store window units and accessories on raised blocks to prevent moisture damage protected from exposure to weather and vandalism.

1.8 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.9 COORDINATION

A. Section 01 30 00 - Administrative Requirements {01300 - Administrative Requirements}: Requirements for coordination.

B. Coordinate work with adjacent materials specified in other Sections and as indicated on Drawings and approved shop drawings.

C. Coordinate installation of anchorages for security windows. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in [concrete] [or] [masonry]. Deliver such items to Project site in time for installation.

1.10 WARRANTY

A. Furnish manufacturer's standard warranty document, executed by an authorized Quikserv Corp. officer in which manufacturer agrees to repair or replace windows, drawers and air curtains that fail in materials or workmanship within specified warranty period. This warranty is in addition to, and not a limitation of other rights Owner has under the contract.

1. Warranty Period:
   a. One year parts and labor from date of installation.
2. Failures include, but are not limited to, the following:
   a. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
   b. Structural failures including deflections exceeding 1/4 inch.
   c. Failure of welds.
   d. Excessive air leakage.
   e. Faulty operation of sliding window hardware.
   f. Faulty operation of transaction drawers.
   g. Faulty operation of air curtains.

PART 2 PRODUCTS

2.1 MATERIALS

A. Aluminum Extrusions: ASTM B221/B221M. Provide alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi (150-MPa) ultimate tensile strength and not less than 0.125 inch (3.2 mm) thick at any location for main frame and sash members. B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Metallic-Coated Steel Sheet:
1. ASTM A653/A653M, CS (Commercial Steel), Type B; with G90 (Z275)zinc (galvanized) coating designation.
2. AMS5511, steel, corrosion-resistant, sheet, strip, and plate, 19Cr - 9.5Ni (304L), solution heat treated.
3. AMS5513, steel, corrosion-resistant, sheet, strip, and plate 19cr 9.2Ni (SAE 30304) solution heat treated.

D. Stainless-Steel Sheet, Strip, Plate, and Flat Bars:
1. ASTM A666, austenitic stainless steel, Type 304, stretcher-leveled standard of flatness.
2. ASME SA-240/SA-240M, chromium and chromium-nickel stainless steel plate, sheet, and strip for general applications..

E. Concealed Bolts: ASTM A307, Grade A unless otherwise indicated.

F. Cast-in-Place Anchors in Concrete: Fabricated from corrosion-resistant materials capable of sustaining, without failure, a load equal to [four] [____} times the load imposed, as determined by testing per ASTM E488, conducted by a qualified testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A27/A27M cast steel or ASTM A 47/A 47M malleable iron. Provide bolts, washers, and shims as required; hot-dip galvanized per ASTM A153/A153M or ASTM F2329.

G. Embedded Plate Anchors: Fabricated from steel shapes and plates, minimum 3/16 inch (4.8 mm) thick; with minimum 1/2-inch- (12.7-mm-) diameter, headed studs welded to back of plate..

H. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

I. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil (0.76-mm) thickness per coat.

J. Sealants: For sealants required within fabricated security windows, provide type recommended by manufacturer for joint size and movement. Sealant shall remain permanently elastic, nonshrinking, and nonmigrating.

K. Gaskets: For gaskets required within fabricated security windows, provide type recommended by manufacturer for joint size and movement. Gaskets shall remain permanently elastic, nonshrinking, and nonmigrating.

2.2 WINDOW COMPONENTS

A. Comply with requirements of UL listing for ballistics-resistance levels as specified.

B. Glass:
1. Tempered Glass: 1/4 inch thick.
2. Insulated Glass: 5/8 inch thick total thickness.

C. Track/Slides: Stainless steel ball bearing slides all windows and drawers.

D. Miscellaneous Glazing Materials: Provide material, size, and shape complying with requirements of glass manufacturers, and with a proven record of compatibility with surfaces contacted in installation:

1. Cleaners, Primers, and Sealers: Type recommended by sealant or gasket manufacturer.
2. Setting Blocks: Elastomeric material with a Type A Shore durometer hardness of 85, plus or minus 5.
3. Spacers: Elastomeric blocks or continuous extrusions with a Type A Shore durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
4. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking). F. Flashing.

E. Welding Materials.

F. Anchors, Clips, and Window Accessories: Stainless steel; hot-dip, zinc-coated steel or iron, of sufficient strength to withstand design pressure indicated.

2.3 EXTERIOR AND INTERIOR SECURITY PASS, SERVICE AND TELLER WINDOW UNITS

A. Manufacturers:
1. Quikserv Corp.
a. Model T1 - 3036S:
1) Rough Opening: 30-3/8 inches (w) x Custom size as indicated on Drawings plus 3/8 inch on all sides.
2) Glazing:
a) [Level 1 Bullet Resistant.]
b) [1/4 inch tempered for Non-Bullet Resistant applications.]
3) Finish: Black

2.5 DRAWERS

A. Refer Section 11 17 00 {11030} Teller and Service Equipment.

2.6 GLAZING

A. Low E Glass: Tempered float glass as specified; Class 2 tinted
1. Clear Low E tempered glass (FG-ECT).
2. Tinted Low E tempered glass (FG-ETT).
3. Minimum Thickness: 1/4 inch.
4. Tint: Tint color as indicated on Drawings, if not indicated on Drawings as selected by Architect.

B) Insulating Glass:

1. Insulating Glass: ASTM E2190 certified by Insulating Glass Certification Council and Insulating Glass Manufacturers Alliance; [with Low E coating on surface 2] [and] glass elastomer edge seal; purge interpane space with dry air; tested in accordance with ASTM E2188 for unit performance and ASTM E2189 for resistance to fogging..

a. Insulating Glass Unit Edge Seal Construction: Aluminum, bent and spot welded corners.

b. Double Pane Insulating Vision Glass (IG-DP): 1) Total Unit Thickness: 5/8 inch.

2.7 DEAL TRAYS AND SHELVES

A. Refer Section 11 17 00 {11030} Teller and Service Equipment.

2.8 INTERCOM AND TALK THROUGH

A. Manufacturers - Intercom:

a. Model: Audio Authority Model 1580S and 1580HS Series:

B. Manufacturers - Talk Through:

1. Quikserv Corp.

a. Model: 6 inch Round Heavy Stainless Steel Level 3 Speak-Thru.

2.9 SECURITY DEVICE ACCESSORIES

A. Security Lock Bar: Sliding aluminum lock bar.

B. Auto-Lock Handle: Stainless steel constructed auto-locking handle on all self-closing sliders to prevent intrusion.

C. Electric Auto-Lock: 3/4 inch stainless steel pin automatically locks behind electric window units to prevent intrusion.

D. Hook-Lock: Maximum security Adams Rite style hook lock on all sliders.

2.10 ELECTRICAL REQUIREMENTS

A. Electrical Windows: 120V / 60 Hz, 20 amp branch circuit, single phase. Conforms to UL Standard 325 – Certified to CAN/CSA C22.2 NO. 247.

B. Non-Heated Air Curtains: 120V / 60 Hz, 15 amp branch circuit, single phase. Conforms to UL Standard 1995 – CSA C22.2.

C. Heated Air Curtains: 208 / 230V / 60 Hz, 30 amp branch circuit, single phase. Conforms to UL Standard 1995 – CSA C22.2.

2.11 FABRICATION

A. Fabricate window to dimensions indicated on Drawings.

B. Fabricate windows, and accessories to provide a complete system for assembly of components and anchorage of window, drawers and accessories.

1. Provide units that are reglazable from the secure side without dismantling the nonsecure side of framing.
2. Prepare security windows for glazing unless preglazing at the factory is indicated.

C. Provide weep holes and internal water passages for exterior security windows to conduct infiltrating water to the exterior.

D. Rigidly fit and secure joints and corners with internal reinforcement. Make joints and connections flush, hairline, and weatherproof. Fully weld corners.

1. Fabricate framing with manufacturer's standard, internal opaque armoring in thicknesses required for security windows to comply with ballistics-resistance performance indicated.

E. Prepare components with reinforcement required for hardware.

F. Welding: To greatest extent possible, weld before finishing and in concealed locations to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

G. Metal Protection: Separate dissimilar metals to protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.

H. Factory-cut openings in glazing for speaking apertures.

I. Preglazed Fabrication: Preglaze window units at factory, where required for applications indicated.

J. Weather Stripping: Factory applied.

K. Bottom Sills: Stainless steel construction, no bottom tracks and no pop rivets.

L. Handles: Stainless steel, manufacturer's standard profile and finish.

2.12 SHOP FINISHING

A. Aluminum Finishes:

1. Mill Finished Aluminum Surfaces: manufacturer's standard finish as selected by Architect.
2. Clear Anodized Aluminum Surfaces: AA-M10C22A31 non-specular as fabricated mechanical finish, medium matte chemical finish, and Architectural Class II 0.7 mils (0.018 mm) clear anodized coating.
   a. Conform to AAMA 611

B. Concealed Steel Items: [Galvanized in accordance with ASTM A123 to thickness Grade 85, 2.0 oz/sq ft (610 gm/sq m).

C. Stainless Steel: 304 Stainless Steel with NAAMM No. 3 finish.

D. Apply bituminous paint to concealed metal surfaces in contact with cementitious or dissimilar materials.

E. Touch-Up Primer for Galvanized Steel Surfaces: SSPC Paint 20 zinc rich.

F. Extent of Finish:
1. Apply factory coating to all surfaces exposed at completed assemblies.
2. Apply finish to surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
3. Apply touch-up materials recommended by coating manufacturer for field application to cut ends and minor damage to factory applied finish.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements {01300 - Administrative Requirements}: Verification of existing conditions before starting work B. Verify construction is ready to receive Products specified in this section.

C. Verify rough openings are correct size and in correct location.

D. Examine roughing-in for embedded and built-in anchors to verify actual locations of security window connections before security window installation.

E. Inspect built-in and cast-in anchor installations, before installing security windows, to verify that anchor installations comply with requirements. Prepare inspection reports.
1. Remove and replace anchors where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.
2. Perform additional inspections to determine compliance of replaced or additional work. Prepare anchor inspection reports.

F. For glazing materials whose orientation is critical for performance, verify installation orientation.

G. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Furnish frames and anchors to other sections as required for installation in surrounding partition and casework construction.

3.3 INSTALLATION

A. Install Products in accordance with manufacturer’s instructions.

B. Align Products plumb, level and square.

C. Rigidly secure Products to adjacent supporting construction.

D. Glaze windows in accordance with manufacturer’s instructions and Section __ __ __.

E. Seal perimeter joints in accordance with Section __ __ __.

F. Connect electrical components to power source.

G. Protection: Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended in writing by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

3.4 ADJUSTING

A. Section 01 70 00 - Execution and Closeout Requirements {01700 - Execution Requirements}: Requirements for adjusting.

B. Adjust horizontal-sliding, transaction security windows to provide a tight fit at contact points for smooth operation and a secure enclosure.

C. Adjust transaction drawers to provide a tight fit at contact points for smooth operation and [weathertight and] secure enclosure.

D. Remove and replace defective work, including security windows that are warped, bowed, or otherwise unacceptable.

3.5 CLEANING AND PROTECTION

A. Section 01 70 00 - Execution and Closeout Requirements {01700 - Execution Requirements}: Requirements for cleaning.

B. Remove protective material from factory finished surfaces.

C. Wash surfaces by method recommended and acceptable to sealant and window manufacturer, rinse and wipe surfaces clean.

D. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer.

E. Clean metal and glass surfaces to polished condition.
1. Lubricate sliding security window hardware.
2. Lubricate transaction drawer hardware.

F. Provide temporary protection to ensure that security windows are without damage at time of Substantial Completion.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain security windows with transaction counter.

END OF SECTION

SECTION 08 71 00
DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Commercial door hardware for the following:
      a. Swinging doors.
   2. Electrified hardware.
   3. Integrated access control hardware.

B. Related Sections:
   1. Division 8: Steel Doors and Frames.
   2. Division 8: Flush Wood Doors.
   3. Division 8: Aluminum Entrances and Storefronts.
   4. Division 26: Electrical.

C. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.
   1. Permanent cores and keys to be installed by Owner.

1.3 SUBMITTALS

A. Product Data: Include installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Details of electrified and access control hardware, indicating the following:
   1. System Block Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring. Include the following for each unique electrified opening:
      a. Point-to-point system wiring and riser diagrams.
      b. Elevation diagram of each door.
      c. Operational description.

C. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
   1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
   2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.

a. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:
   a. Type, style, function, size, label, hand, and finish of each door hardware item.
   b. Manufacturer of each item.
   c. Fastenings and other pertinent information.
   d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
   e. Explanation of abbreviations, symbols, and codes contained in schedule.
   f. Mounting locations for door hardware.
   g. Door and frame sizes and materials.
   h. Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.
      1) Sequence of Operation: Include description of component functions including, but not limited to, the following situations: normal secured/unsecured state of door; authorized access; authorized egress; unauthorized access; unauthorized egress; fire alarm and loss of power conditions.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

D. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve all lock functions and submitted keying schedule prior to the ordering of permanent cylinders. Material Supplier to coordinate all Keying requirements directly with Owner and General Contractor.

E. Submittal shall be embossed or have the imprint of a Certified, up to date, Seal stamp.

F. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 1.

G. Fire-Rated Door Assembly Testing: Per NFPA80, submit a written record of each fire door assembly to the Owner to be made available to the Authority Having Jurisdiction (AHJ) for future building inspections as may be applicable.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced Installer who has completed both standard and electrified Builders hardware and integrated access control installations similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Supplier Qualifications: Door hardware supplier with warehousing facilities in Project's vicinity and who is or employs a qualified Architectural Hardware Consultant available during the Work to consult with Contractor, Architect, and Owner about door hardware and keying. Supplier recognized by manufacturers to be a direct, factory-authorized distributor of the specified hardware products.
   1. Access Control and Electrified Door Hardware Supplier Qualifications: An experienced access control systems integrator who is or employs a qualified Physical Security Professional available during the Work to consult with Contractor, Architect and

Owner about integrated access control and security systems. Supplier recognized as an authorized distributor and installer by the manufacturer of primary materials.

2. Scheduling Responsibility: Preparation of door hardware and keying schedules.

C Architectural Hardware Consultant Qualifications: A person who is currently certified by the Door and Hardware Institute as an Architectural Hardware Consultant (AHC), active in the DHI Continuing Education Program with an up to date Seal, and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project. Go to http://www.dhi/org/ to search list for local Architectural Hardware Consultants.

1 Access Control Consultant Qualifications: A person who is currently certified by ASIS as a Physical Security Professional (PSP) and who is experienced in providing on site consulting services for electrified door hardware and integrated access control installations that are comparable in material, design, and extent to that indicated for this Project.

D Source Limitations: Obtain each type and variety of aluminum, steel and wood door hardware from the same single manufacturer, unless otherwise indicated.

1. Provide electrified door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
2. Provide standard door hardware, electrified hardware and access control hardware as a single sourced package from the same qualified supplier.

E. Regulatory Requirements: Comply with provisions of the following:

1. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1 as follows:
   a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
   b. Door Closers: Comply with the following maximum opening-force requirements indicated:
      1) Interior Hinged Doors: 5 lbf applied perpendicular to door.
      2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
   c. Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2.

2. NFPA 101: Comply with the following for means of egress doors:
   a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
   b. Thresholds: Not more than 1/2 inch high.

3. International Building Code IBC2021with Local Amendments..

F. Fire-Rated Door Assemblies: If required, provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing per NFPA 252 (neutral pressure at 40" above sill) or UL-10C.

1. To ensure compliance with Positive Pressure criteria as required by UBC7-2, UL10C, NFPA5000 and all applicable Local, State and National Code Jurisdictions, all Doors and Frames should be checked for accurate installation per Manufacturers installation instructions to provide proper fire and Smoke Gasketing as tested and listed using a PL2 Frame Set or similar Tool.

G. Keying Conference: Conduct conference to comply with requirements in Division 1 Section "Project Meetings." Supplier to meet with Owner and General Contractor to finalize keying requirements and to obtain final instructions in writing. Keying conference to incorporate the following criteria into the final keying schedule document:
1. Function of building, purpose of each area and degree of security required.
2. Review and verify lock function for every opening.
3. Plans for existing Schlage Everest IC S123 system and future expansion.
4. Requirements for key control system.
5. Installation of permanent keys and cylinder cores as required.
6. Provide Key Biting List.
7. Provide extra Key Blank and Cylinders.
8. Address for delivery of keys.
9. Review and confirm all Electric/Electronic Opening Operational Descriptions.
10. Review and Coordinate all Access Control components.

H. Pre-Installation Conference: Conduct conference at Project site attended by representatives of Supplier, Installer, and Contractor to review proper hardware installation methods and the procedures for receiving and handling hardware. At completion of installation, provide written certification that hardware items were applied per conference recommendations and to finish hardware specifications.
1. Inspect and discuss electrical roughing-in and other preparatory work performed by other trades.
2. Review and confirm Keying System requirements.
3. Review and confirm Security System requirements.
4. Review sequence of operation for each type of electrified door hardware.
5. Review and finalize construction schedule and verify availability of materials.
6. Review required testing, inspecting, and certifying procedures.
7. Contractor is responsible for scheduling conferences w/ the Owner & Architect, in a timely manner so as to avoid any delays in the work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site**. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.**

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard, electrified and access control hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Access Control and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and access control equipment with required connections to source power junction boxes, power supplies, detection and monitoring hardware and fire alarm system.

1.7 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of standard, electrified hardware and access control hardware that fails in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

C. Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods: Five years for mortise and bored latches and locksets, ten years for manual door closers, and two years for electromechanical door hardware.

E. Extended Warranty: Provisions for a separate optional extended warranty and maintenance contract is required for the access control system. Version upgrades and "fix" releases to the software, beyond the general warranty time period, are available at no extra charge only if the end user is under a valid extended warranty and maintenance contract.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

B. Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of door hardware and integrated access control systems suppliers and installers. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door opening operation. Provide parts and supplies as used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in this Section and the Door Hardware Schedule at the end of Part 3.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated for named products listed in Hardware Sets.
2. Sequence of Operation: Provide electrified and access control hardware function, sequence of operation, and interface with other building control systems indicated.

B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Schedule at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule. **(Source manufacturer listed in boldface).**

2.2 HINGES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Butt Hinges:
   - **a. PBB, Inc.**
   - b. (PBB).Stanley a Dormakaba Company (STA).
   - c. Bommer Industries (BOM).

2. Continuous Geared Hinges:
   - **a. PBB, Inc. (PBB).**
   - b. Stanley a Dormakaba Company (STA).
   - c. Bommer Industries (BOM).

B. Standards: BHMA Certified products complying with the following:
1. Butts and Hinges: BHMA A156.1.
2. Continuous Geared Hinges: BHMA A156.26.
3. Template Hinge Dimensions: BHMA A156.7.

C. Quantity: Provide the following, unless otherwise indicated:
1. Two Hinges: For doors with heights up to 60 inches.
2. Three Hinges: For doors with heights 61 to 90 inches.
3. Four Hinges: For doors with heights 91 to 120 inches.
4. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches (of door height greater than 120 inches.

D. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

Maximum Door Size (inches)	Hinge Height (inches)	Metal Thickness (inches) Standard Weight	Heavy Weight
Up to 48 by 86 by 1-3/4	4-1/2	0.134	0.180
48 by 120 by 1-3/4	5	0.146	0.190

E. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
1. Exterior Doors: Heavy weight, non-ferrous, ball bearing hinges.
2. Interior Doors: Heavy weight, steel, ball bearing hinges unless Hardware Sets indicate standard weight.

F. Hinge Options: Comply with the following where indicated in the Door Hardware Schedule or on Drawings:

1. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the following applications:
   a. Out-swinging exterior doors.
   b. Out-swinging access controlled doors.

G. Continuous-Geared Hinges: Minimum 0.120-inch thick, hinge leaves with minimum overall width of 4 inches; fabricated to full height of door and frame. Fabricate hinges non- handed and to template screw locations. Continuous hinges guaranteed for the life of the opening.
1. Electrical Transfer Hinge: Provide electric transfer as identified and listed in Hardware Sets.

2.3 LOCKS AND LATCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Mechanical Mortise Locks and Latches:
   a. DORMA a Dormakaba Company (DOR) – M9000 Series.
   b. Sargent Manufacturing an Assa Abloy Company (SAR) - 8200 Series.
   c. Schlage Lock - Allegion (SCH) – L9000 Series.

3. Mechanical Bored Locks and Latches:
   a. DORMA a Dormakaba Company (DOR) – C100 Series.
   b. Sargent Manufacturing an Assa Abloy Company (SAR) - 10-Line Series.
   c. Schlage Lock - Allegion (SCH) - ND Series.

B. Standards: Comply with the following:
1. Mortise Locks and Latches: BHMA A156.13.
2. Bored Locks and Latches: BHMA A156.2.

C. Mortise Locks: BHMA Certified Grade 1, Series 1000.

D. Bored Locks: BHMA Certified Grade 1, Series 4000.

E. Lock Trim: Match the following design style:
1. Lever: DORMA a Dormakaba Company (DOR) - LR Trim.

F. Lock Functions: Function numbers and descriptions indicated in the Door Hardware Schedule comply with the following:
1. Mortise Locks: BHMA A156.13.
2. Bored Locks: BHMA A156.2.

G. Lock Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:
1. Mortise Locks: Minimum 3/4-inch latchbolt throw.
2. Bored Locks: Minimum 1/2-inch latchbolt throw.
3. Deadbolts: Minimum 1-inch bolt throw.

H. Backset: 2-3/4 inches unless otherwise indicated.

I. Knurl all knobs or levers to mechanical rooms, electrical rooms or closets, and all other hazardous or dangerous areas as required by Code. Fire Exit Stair Door Hardware shall not be knurled.

2.4 ELECTRIFIED LOCKS

A. Manufacturers: Subject to same compliance standards and requirements as mechanical locksets, provide products by one of the following:

1. Electromechanical Mortise Locks:
   a. DORMA a Dormakaba Company (DOR) - M9000 Series.
   b. Sargent Manufacturing an Assa Abloy Company (SAR) - 8270 Series.
   c. Schlage Lock - Allegion (SCH) – L9000 Series.

2. Electrified Options: As indicated in hardware sets, provide electrified lock options including outside door trim control, latchbolt and lock/unlock status monitoring, and request-to-exit signaling. Unless otherwise indicated, provide electrified locksets standard as fail secure.

2.5 CYLINDERS AND KEYING

A. Provide Small Format Interchangeable Core Cylinders Manufacturers Brand and Keyway as determined and confirmed by Owner.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cylinders:
   a. Schlage - Allegion (SCH) – IC Everest S123 Cylinders.
   b. Match Owners existing key system.

C. Standards: Comply with the following:
1. Cylinders: BHMA A156.5.

D. Cylinder Grade: BHMA Certified Grade 1.

E. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
1. Small Format Removable Cores: Core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.

F. Construction Keying: Only as required by Owner.

G. Keying System: As directed by Owner.

H. Keys: As directed by Owner.

I. Key Registration List: Provide keying transcript list to Owner's representative for lock cylinders.

J. Key Control System: Provide one MMF Industries lockable cabinet for key control and storage. Cabinet to provide for 50% future expansion.

2.6 STRIKES

A. Standards: Comply with the following:
1. Strikes for Bored Locks and Latches: BHMA A156.2.
2. Strikes for Mortise Locks and Latches: BHMA A156.13.

B. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece anti friction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.

2.7 CLOSERS

A. Manufacturers: Subject to compliance with requirements, provide products by one the following:

1. Surface-Mounted Closers (Standard Duty):
   - **a. DORMA a Dormakaba Company (DOR) - 8616 Series.**
   - b. Sargent Manufacturing an Assa Abloy Company (SAR) - 281 Series.
   - c. LCN Door Closers - Allegion (LCN) - 4040 Series.

B. Standards: Comply with the following:

1. Closers: BHMA A156.4.

C. Surface Closers: BHMA Certified Grade 1.

D. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide non-handed, factory-sized closers adjustable to meet field conditions and requirements for opening force. Unless otherwise indicated, all door closers are to be mounted inside rooms not visible from a corridor or lobby.

E. Closer Options: As indicated in hardware sets, or required for proper installation, provide Manufacturers reinforcements for all door closer options including delayed action, hold open arms, extra duty parallel arms, positive stop/hold open arms, compression stop/hold open arms, special mounting brackets, spacers and drop plates. Through bolt type mounting is required as indicated in the door hardware sets.

2.8 OPERATING and PROTECTIVE TRIM UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Metal Protective Trim Units:
   - **a. Trimco Manufacturing (TRI).**
   - b. Burns Manufacturing (BUR).
   - c. Ives Hardware - Allegion (IVE).

B. Standard: Comply with BHMA A156.6.

C. Materials: Fabricate protection plates from the following:

1. Stainless Steel: 050 inches thick, beveled four sides (B4E) with countersunk screw holes.

D. Push-Pull Design: Minimum 1" Round. Provide 90-degree offset pulls at exterior openings.

E. Fasteners: Provide manufacturer's designated fastener type as indicated in door hardware sets.

F. Furnish protection plates sized two inches less than door width (LDW) on push side and by height specified in door hardware sets.

2.9 STOPS AND BUMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Stops and Bumpers:
   a. Trimco Manufacturing (TRI).
   b. Burns Manufacturing (BUR).
   c. Ives Hardware - Allegion (IVE).

B. Standards: Comply with the following:
1. Stops and Bumpers: BHMA A156.16.
2. Door Silencers: BHMA A156.16.

C. Stops and Bumpers: BHMA Certified Grade 1.

D. Floor Stops: For doors, unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic.
1. Where floor or wall stops are not appropriate, provide overhead stops.

E. Silencers for Metal Door Frames: BHMA Grade 1; neoprene or rubber, minimum diameter 1/2 inch fabricated for drilled-in application to frame. Provide (3) per single door and (2) per paired door frame. Code requires holes in frames be filled with product or fasteners.

2.10 DOOR THRESHOLDS, WEATHERSTRIPPING AND GASKETING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Door Thresholds, Weatherstripping and Gasket Seals:
   a. Reese Products (REE).
   b. Pemko Manufacturing an Assa Abloy Company (PEM).
   c. Zero International (ZER).

B. Standard: Comply with BHMA A156.22.

C. General: Provide continuous weatherstrip seal on exterior doors and smoke, light, or sound gasketing on interior doors where specified. Provide non-corrosive fasteners for exterior applications.
1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame. Install header seal before mounting door closer arms.
2. Door Sweep: Apply to bottom of door, forming seal with threshold when door is closed.

D. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing per UL 1784.
1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

E. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing per UL-10C.

1. Intumescent Seals and Gasketing: Provide concealed, Category A type gasketing systems on assemblies only where an intumescent seal is required by Door Manufacturer to meet IBC and UL-10C positive pressure labeling.

2.11 MISCELLANEOUS HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Power Supplies: Modular unit in NEMA ICS 6, Type 4 enclosures; filtered and regulated; voltage rating and type matching requirements of door hardware served; and listed and labeled for use with fire alarm systems.

C. Auxiliary Power Supplies: As required by all Local, State, and Federal code requirements to meet all isolated and redundancy requirements for Life Safety. Modular unit in NEMA ICS 6, Type 4 enclosures; filtered and regulated; voltage rating and type matching requirements of door hardware served; and listed and labeled for use with fire alarm systems.

1. Boxed Power Supplies:
   a. Match Manufacture of Hardware Product served.
   b. Substitution not allowed.

2.12 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws per manufacturers recognized installation standards for application intended.

2.13 FINISHES

A. Standard: Comply with BHMA A156.18.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case, less than specified by referenced standards for the applicable units of hardware.

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

D. Finishes on locksets, and latchsets should incorporate an FDA recognized antimicrobial coating (AM) listed for use on medical and food preparation equipment that will suppress the growth and spread of a broad range of bacteria, algae, fungus, mold and mildew.

E. BHMA Designations: Comply with base material and finish requirements indicated by the following:
   a. BHMA 600: Primed for painting, over steel base metal.
   b. BHMA 626: Satin chromium plated over nickel, over brass or bronze base metal.
   c. BHMA 628: Satin aluminum, clear anodized, over aluminum base metal.
   d. BHMA 630: Satin stainless steel, over stainless-steel base metal.
   e. BHMA 689: Aluminum painted, over any base metal.

1. BHMA 606/US4: “Brushed Satin Brass” Shall be the Finish for all Hardware, where practicable, at all interior elements. (Hardware Elements at all Aluminum Storefront and Curtain Wall Systems shall match Finishes of respective Aluminum Frames, and are to be provided & Installed by the Supplier of Aluminum Storefront System.)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Examine roughing-in for electrical source power to verify actual locations of wiring connections before electrified door hardware installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Steel Doors and Frames: Comply with ANSI/BHMA A115 series.

B. Electrified Openings: Provide steel doors and frames and wood doors prepared to receive electrified hardware connections specified in Door Hardware Sets without additional modification.

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and re-installation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

C. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

3.4 FIELD QUALITY CONTROL

A. Field Inspection: Secure the services of an Architectural Hardware Consultant (AHC) to perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted per NFPA80 Current Edition.
   1. Architectural Hardware Consultant will inspect all swinging doors and hardware immediately following completion of installation and state in report whether installed work complies with or deviates from specifications or construction document requirements.
      a. Inspection Scope:
         1) Inspect all swinging doors and door hardware.
         2) Inspector to furnish a Field Quality Report, itemized per each individual opening, to the Architect within 7 days of the inspection, including:
            a) Deficiencies in workmanship and standard industry practices.
            b) Use of allowable products.
            c) Use of manufacturer recommended fasteners.
            d) Compliance with the ADA.
            e) Proper door/frame/hardware clearances.
            f) Problems related to function, security, aesthetics, or maintenance.
      b. Inspector Qualifications:
         1) Certified Architectural Hardware Consultant.
         2) Entirely independent of the supply side of the project, having no familial or financial relationship with any manufacturer, manufacturer's representative, distributor, installer or supplier used on this project.
         3) Full-time (40 hours per week) engaged in the writing of hardware specifications and on-site inspections.
         4) Approved by Architect. Go to http://www.dhi/org/ to search list for local Architectural Hardware Consultants.

B. Field Inspection: Secure the services of an Access Control System Consultant to perform a final inspection of installed access control door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.
   1. Access Control System Consultant will inspect integrated electronic and access control hardware and state in report whether installed work complies with or deviates from requirements, including whether electronic and access control hardware is properly installed and performing per system operational descriptions.
      a. Inspection: Verify that units and controls are properly installed, connected, and labeled and that interconnecting wires and terminals are identified.
      b. Pre-testing: Program and adjust the system and pretest all components, wiring, and functions to verify they conform to specified requirements. Replace malfunctioning or damaged items with new items.
      c. Acceptance Test Schedule: Schedule tests after pre-testing has been successfully completed and system has been in normal functional operation for at least 2 weeks.
      d. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
   1. Door Closers: Adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

B. Fire-Rated Door Assembly Testing: Upon completion of the installation, each fire door assembly in the project shall be tested to confirm proper operation of its closing device and that it meets all criteria of a fire door assembly as per current NFPA80 Edition. The inspection of the fire doors is to be performed by individuals with knowledge and understanding of the operation components of the type of door being subjected to testing who are acceptable by the Authority Having Jurisdiction (AHJ). A written record shall be maintained and transmitted to the Owner to be made available to the Authority Having Jurisdiction (AHJ). The record shall list each fire door assembly throughout the project, and include each door number, and itemized list of hardware set components at each door opening, and each door location in the facility.

C. Six-Month Adjustment: Approximately six months after date of Substantial Completion, Installer shall perform the following:

1. Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.
2. Consult with and instruct Owner's personnel on recommended maintenance procedures.
3. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.

3.6 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper finish and provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Secure the services of a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes.

B. Secure the services of a Certified Fire Door Assembly Inspector to complete inspection requirements per current edition NFPA 80 Current Edition Chapter 5.

3.8 DOOR HARDWARE SETS

A. The hardware sets listed below represent the design intent and direction of the Owner and Architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the Architect with corrections made prior to the bidding process.

HARDWARE SETS

Provided By Manufacturer

END OF SECTION

SECTION 08 81 00
GLAZING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included: Furnish and install glass specified.

1.02 RELATED DOCUMENTS

A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are located in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

A. In accordance with Section 01 3000.

B. Substitutions will not be considered prior to the award of the General Contract.

1.04 QUALITY ASSURANCE

A. Qualifications of Installers: Provide at least one person thoroughly trained and experienced in skills required, completely familiar with referenced standards and requirements of this work and to personally direct installation performed under this Section.

B. Applicable Standards For Glass and Glazing Work: Conform to the "Manual of Glazing" of the Flat Glass Marketing Association, requirements of Federal Specification DD-G-451c and Safety Standard 16 CFR 1201 of the U.S. Consumer Products Safety Commission.

1.05 PRODUCT HANDLING

A. Protection: Protect glass and glazing materials before, during, and after installation. Protect installed work and materials of other trades.

B. Replacements: In event of damage, immediately make repairs and replacements necessary and at Contractor's expense.

PART 2 - PRODUCTS

2.01 GENERAL QUALITY REQUIREMENTS

A. No manufacturer logos are allowed on any glass. Provide certification to General Contractor that tempered, heat strengthened, annealed, laminated, etc. glass was used where required.

B. Annealed float glass shall comply with ASTM C1036, Type I, Class 1 (clear), Class 2 (tinted), Quality-Q3.

C. Heat-strengthened float glass shall comply with ASTM C1048, TypeI, Class 1 (clear), Class 2 (tinted), Quality Q3, Kind HS.

D. Tempered float glass shall comply with ASTM C1048, Type I, Class 1 (clear), Class 2 (tinted), Quality Q3, Kind FT.

E. Laminated glass to comply with ASTM C1172.

F. IG units consist of glass lites separated by a dehydrated airspace that is hermetically dual sealed with a primary seal of polyisobutylene (PIB) or Thermoplastic Spacer (TPS) a and a secondary seal of silicone or an organic sealant depending on the application.

G. Insulating glass units are certified through the Insulating Glass Certification Council (IGCC) to ASTM E2190.

H. Special Glass Required by Building Code:
1. Provide safety glazing as required by code.
2. Provide heat strengthened glass where required by design pressures, anticipated thermal stress, or use in spandrel areas.
3. Provide fully tempered glass only where safety glazing is mandatory or where pressures exceed capacity of heat strengthened glass.
4. Provide Fire Resistive and/or Fire Protective rated glass where required.

2.02 GLASS AND COATING SCHEDULES

A. Monolithic Glass Schedule:

GL1: 1/4" CLEAR, TEMPERED

GL2: 1/2" CLEAR, ACOUSTICAL, LAMINATE
- a. Outer Layer: 1/4” clear tempered float glass.
- b. Interlayer: Polyvinyl butyral (PVB) plastic interlayer, clear, 0.060 inch thick.
- c. Inner Layer: 1/4” clear tempered float glass.

GL3: 1/2" CLEAR, SECURITY, LAMINATE
- a. Outer Layer: 1/4” clear tempered float glass.
- b. Interlayer: Polyvinyl butyral (PVB) plastic interlayer, clear, 0.060 inch thick.
- c. Inner Layer: 1/4” clear tempered float glass.
- d. 3M S140 with 3M Impact Protection Attachment (IPA) Sealant. Film on Surface No.4.

GL-4 Mirror Glass: Nominal 1/4” thick, conforming to ASTM C 1036, Type I, Class 1, Quality q2, and with silvering, electro-plated copper coating, and protective organic coating.

2.03 FIRE RATED GLASS

A. Labeling: Permanently label each piece of glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name; test standard; whether glazing is permitted to be used in doors or openings; if permitted in openings, whether or not glazing has passed the hose-stream test; whether or not glazing meets 450 deg F (250 deg C) temperature-rise limitation; and the fire-resistance rating in minutes.
1. Fire-protection-rated glazing required to have a fire-protection rating of 20 minutes shall be exempt from the hose-stream test.

B. Fire Rating: Fire rating listed and labeled by UL for fire rating scheduled at opening locations on drawings, when tested in accordance with the following:
1. Walls: ASTM E119 or UL 263
2. Windows: NFPA 257 or UL 9
3. Doors: NPFA 252 or UL 10B or UL 10C

C. Vision Panels in Doors:

FRG-1 20 minute rating: Fire Protective Rated Tempered Glass, ¼” thickness, and complying with 16 CFR 1201, Category II.
- a. Safti First; SuperLite I.
- b. Technical Glass Products; Fireglass20.

FRG-2 45 minute or greater rating: Laminated Ceramic Glazing, Laminated glass made from two plies of clear, ceramic glass; 8-mm total thickness; and complying with 16 CFR 1201, Category II.
- a.

e. Safti First; Pyran Platinum L
b. Technical Glass Products; FireLite Plus.

D. Sidelights, Transoms and Windows: 1 hour or greater fire resistant rating.
FRG-3 Fire-resistant-rated; and complying with 16 CFR 1201, Category II.
a. Technical Glass Products; Pyrostop.
b. Safti First; SuperLite II-XL

E. Glazing Compound for Fire-rated Glazing Materials:
1. Dow Corning 795 - Dow Corning Corp.
2. Silglaze-II 2800 - General Electric Co.
3. Spectrem 2 - Tremco Inc.

F. Setting Blocks: Neoprene, EPDM, or silicone; tested for compatibility with glazing compound; of 70 to 90 Shore A hardness.

G. Cleaners, Primers, and Sealers: Type recommended by manufacturer of glass and gaskets.

2.04 INSULATING GLASS UNITS

A. Manufacturer is used in this section to refer to a firm that produces primary glass or fabricated glass as defined in the referenced standards.
1. Oldcastle Glass
2. Guardian Industries
3. Pilkington
4. Vitro Industries
5. Visteon Float Glass
6. Approved equal

B. Insulating glass units are certified through the Insulating Glass Certification Council (IGCC) to either ASTM E774, or to ASTM E2190, or both.

C. Insulating glass shall have double edge seals. Primary seal shall be extruded polyisobutylene continuously bonded to glass surfaces and desiccant filled metal spacer, including corners. Minimum width of primary seal shall be 0.125 inch. Secondary seal shall be Momentive IGS 3723 or Dow Corning 982. Secondary seal shall completely cover spacer with no gaps or voids, and shall be continuously bonded to both plates of glass. Where insulating glass is supported by structural silicone, secondary seal shall be designed to transfer specified pressures from outdoor glass to indoor glass.
1. At structural silicone glazed assemblies, the metal spacer between panes of glass is to be Black.

2.05 SOLAR CONTROL INSULATING COATED GLASS

A. (Vision) Double-Glazed Sputter-Coated Insulating Glass Units:
IGU-1A 1" INSULATED VISION GLASS CLEAR
1. Outboard Lite: 1/4” clear tempered float glass.
a. Coating on Surface No. 2: SunGuard SNX 62/27.
2. Air Space: 12 mm (1/2 inch) wide, hermetically sealed, dehydrated air space.
3. Inboard Lite: 1/4” Clear tempered or annealed Float Glass: ASTM C 1036, Type 1, Class 1, Quality q3.

B. (Spandrel) Double-Glazed Sputter-Coated Insulating Glass Units:
IGU-1B 1" INSULATED GLASS, SPANDREL
1. Outboard Lite: 1/4” clear tempered float glass.
a. Coating on Surface No. 2: SunGuard SNR 43.
2. Air Space: 12 mm (1/2 inch) wide, hermetically sealed, dehydrated air space.
3. Inboard Lite: 1/4” Clear tempered or annelaed Float Glass: ASTM C 1036, Type 1, Class 1, Quality q3. Ceramic Frit on No. 4 surface: Charcoal Gray

C. (Security) Double-Glazed Sputter-Coated Insulating Glass Units:
IGU-1C 1" INSULATED VISION GLASS CLEAR W/ LEVEL 1 SHATTER-PROOF FILM
1. Outboard Lite: 1/4" clear tempered float glass.
   a. Coating on Surface No. 2: SunGuard SNX 62/27.
2. Air Space: 12 mm (1/2 inch) wide, hermetically sealed, dehydrated air space.
3. Inboard Lite: 1/4" Clear tempered or annelaed Float Glass: ASTM C 1036, Type 1, Class 1, Quality q3.
   a. 3M S140 with 3M Impact Protection Attachment (IPA) Sealant. Film on Surface No.4.

D. (Patterned) Double-Glazed Sputter-Coated Insulating Glass Units:
IGU-1D 1" INSULATED VISION GLASS CLEAR W/ FROSTED FILM
1. Outboard Lite: 1/4" clear tempered float glass.
   a. Coating on Surface No. 2: SunGuard SNX 62/27.
2. Air Space: 12 mm (1/2 inch) wide, hermetically sealed, dehydrated air space.
3. Inboard Lite: 1/4" Clear tempered or annelaed Float Glass: ASTM C 1036, Type 1, Class 1, Quality q3.
   a. With 3M Fasara decorative window film selected from Fabric, Frost & Matte Patterns. Film on Surface No.4.

E. Assembly
1. Sealing System: Dual seal, approved by glass manufacturer
2. Spacer: Aluminum with black, color anodic finish

2.06 SOLAR CONTROL INSULATING LAMINATED COATED GLASS – COLOR LAMINATED OUTBOARD

A. (Vision) Double-Glazed Sputter-Coated Insulating Glass Units with Vanceva Color Laminated Outboard Lite:
IGU-B1:A INSULATED VISION GLASS, LIGHT BLUE COLOR
IGU-B2:A INSULATED VISION GLASS, DARK BLUE COLOR
IGU-Y1:A INSULATED VISION GLASS, LIGHT YELLOW COLOR
IGU-Y2:A INSULATED VISION GLASS, DARK YELLOW COLOR

1. Outboard Lite:
   a. Outer Layer: 1/4" [Guardian UltraClear®] [CrystalClear®] tempered or annealed float glass.
   b. Interlayer: Polyvinyl butyral (PVB) plastic interlayer, clear, [0.060 inch] thick. Custom Color by Vanceva with up to 4 layers of PVB
   c. Inner Layer: 1/4" [Guardian UltraClear®] [CrystalClear®] tempered or annealed float glass.
2. Air Space: 12 mm (1/2 inch) wide, hermetically sealed, dehydrated air space.
3. Inboard Lite:
   a. 1/4" Clear tempered or annealed Float Glass: ASTM C 1036, Type 1, Class 1, Quality q3.
   b. Vacuum Deposition Sputtered Coating on No. 5 surface: SunGuard SNR 43.

B. (Spandrel) Double-Glazed Sputter-Coated Insulating Glass Units with Vanceva Color Laminated Outboard Lite:
IGU-B1:B INSULATED GLASS, LIGHT BLUE COLOR, SPANDREL
IGU-B2:B INSULATED GLASS, DARK BLUE COLOR, SPANDREL
IGU-Y1:B INSULATED GLASS, LIGHT YELLOW COLOR, SPANDREL
IGU-Y2:B INSULATED GLASS, DARK YELLOW COLOR, SPANDREL
1. Outboard Lite:
   a. Outer Layer: 1/4" [Guardian UltraClear®] [CrystalClear®] tempered or annealed float glass.
   b. Interlayer: Polyvinyl butyral (PVB) plastic interlayer, clear, [0.060 inch] thick. Custom Color by Vanceva with up to 4 layers of PVB

c. Inner Layer: 1/4” [Guardian UltraClear®] [CrystalClear®] tempered or annealed float glass.

2. Air Space: 12 mm (1/2 inch) wide, hermetically sealed, dehydrated air space.
3. Inboard Lite:
   a. 1/4” Clear tempered or annealed Float Glass: ASTM C 1036, Type 1, Class 1, Quality q3.
   b. Vacuum Deposition Sputtered Coating on No. 5 surface: SunGuard SNR 43.
   c. Ceramic Frit on No. 6 surface: Charcoal Gray

C. Assembly
1. Sealing System: Dual seal, approved by glass manufacturer
2. Spacer: Aluminum with black, color anodic finish

2.07 SOLAR CONTROL INSULATING LAMINATED COATED GLASS – CLEAR LAMINATED INBOARD

A. (Vision) Double-Glazed Sputter-Coated Insulating Glass Units with Laminated Inboard Lite: IGU-C1:A INSULATED VISION GLASS, CLEAR
1. Outboard Lite: 1/4” clear tempered float glass.
   a. Coating on Surface No. 2: SunGuard SNX 62/27.
2. Air Space: 12 mm (1/2 inch) wide, hermetically sealed, dehydrated air space.
3. Inboard Laminated Glass Unit:
   a. Outer Layer: 1/4” Clear tempered or annelaed Float Glass: ASTM C 1036, Type 1, Class 1, Quality q3.
   b. Interlayer: Polyvinyl butyral (PVB) plastic interlayer, clear, 0.060 inch thick.
   c. Inner Layer: 1/4” Clear tempered or annealed Float Glass: ASTM C 1036, Type 1, Class 1, Quality q3.
4. Glass Unit Performance Characteristics:
   a. Visible Light Transmittance: 42 percent.
   b. Solar Heat Gain Coefficient: .22

B. (Spandrel) Double-Glazed Sputter-Coated Insulating Glass Units with Laminated Inboard Lite: IGU-C1:B INSULATED GLASS, CLEAR, SPANDREL
1. Outboard Lite: 1/4” clear tempered float glass.
   a. Coating on Surface No. 2: SunGuard SNX 62/27.
2. Air Space: 12 mm (1/2 inch) wide, hermetically sealed, dehydrated air space.
3. Inboard Laminated Glass Unit:
   a. Outer Layer: 1/4” Clear tempered or annelaed Float Glass: ASTM C 1036, Type 1, Class 1, Quality q3.
   b. Interlayer: Polyvinyl butyral (PVB) plastic interlayer, clear, 0.060 inch thick.
   c. Inner Layer: 1/4” Clear tempered or annealed Float Glass: ASTM C 1036, Type 1, Class 1, Quality q3.
   d. Ceramic Frit on No. 6 surface: Charcoal Gray

C. Assembly
1. Sealing System: Dual seal, approved by glass manufacturer
2. Spacer: Aluminum with black, color anodic finish

2.08 GLAZING ACCESSORIES

A. Provide glazing accessories required to complete glazing work that are compatible with various components of the glazing system(s), and subject to approval of Architect.

B. Glazing Sealants: As specified in Section 07 9000

C. Glazing gaskets, sealant backers within glazing pockets, and continuous glass spacer pads at structural silicone shall be black extruded dense silicone.

D. Glazing Tape: Bostik "Chem Tape 60", Pecora "Shim-Seal", or Tremco "Pre-shimmed Tremco 440 Tape".

E. Setting Blocks: Silicone blocks tested for compatibility with specified glazing sealants. Provide side blocks at both jambs, between midheight and top corner of glass, at four-side conventional dry glazed openings. Side blocks are not required where glass is continuously sealed with silicone sealant at two or more edges.

F. Spacers: Saint-Gobain Performance Plastics V2100 Thermalbond Tape is acceptable as a glass spacer when used in conjunction with structural silicone, subject to verification of compatibility.

G. Compressible Filler Rod: Closed-cell or waterproof-jacketed foam of polyethylene, butyl rubber, neoprene, polyurethane or vinyl, tested for compatibility with specified glazing sealants, of 5 to 10 psi compression strength (25% deflection), recommended by sealant manufacturer for use in glazing channel to prevent sealant exudation from the channel.

H. Mirror Mastic: An adhesive setting compound, produced specifically for setting mirrors by spot application method (25% coverage) without support, to be used in 1/8" to 1/2" thickness.

PART 3 - EXECUTION

3.01 GLASS SIZES

A. Measure sizes for glass from actual frames, doors and windows. Contract requires glass to be set in place, and Contractor assumes responsibility for correct sizes. Use sizes shown on Drawings for estimating only as approximate dimensions.

3.02 GLAZING SURFACES

A. Glaze only dry surfaces, free from dust or ice. Clean dirty surfaces with cloth saturated with turpentine or mineral spirits before glazing. Remove loose dirt particles and mortar from recesses prior to installation of glass and glazing materials.

3.03 SETTING GLASS

A. Set glass to provide equal bearing for entire width of each pane. Contractor responsible for broken glass due to improper setting. Set using glazing stops furnished by door or fixed framing manufacturer unless otherwise shown or specified. Accurately set glass to fit frame, with all edges smooth. Sharp ragged edges are not acceptable. Cushion glass in fixed interior view windows with felt strips around entire perimeter.

3.04 CLEANING GLASS

A. Contractor shall employ services of a professional window washer at completion of all work to wash glass which has been installed under this contract, removing all stains.

B. Clean glass on both sides after painting operations are complete and dry. Do not use acid solutions or caustic soaps to clean glass.

C. Do not use razor blades to clean glass. Any scratches on the glass caused by the cleaning process will be cause for the removal and replacement of the damaged glass at the Contractor's expense.

END OF SECTION

SECTION 08873

SAFETY AND SECURITY WINDOW FILM

Display hidden notes to specifier by using "Tools"/"Options"/"View"/"Hidden Text".

GENERAL

1.1 SECTION INCLUDES

A. Safety and Security Film.

1.2 RELATED SECTIONS

A. Section 08500 - Windows: Windows to receive solar control film.

B. Section 08600 - Skylights: Glass Skylights to receive solar control film.

C. Section 08800 - Glazing: General Glazing applications to receive solar control film.

D. Section 08900 - Glazed Curtain Walls: Curtain Walls to receive solar control film.

1.3 REFERENCES

A. ASHRAE - American Society for Heating, Refrigeration, and Air Conditioning Engineers; Handbook of Fundamentals, 1997 Edition.

B. ASTM D 1044 - Standard Method of Test for Resistance of Transparent Plastics to Surface Abrasion (Taber Abrader Test).

C. ASTM E 84 - Standard Method of Test for Surface Burning Characteristics of Building Materials.

D. ASTM E 308 - Standard Recommended Practice for Spectophotometry and Description of Color in CIE 1931 System.

E. ASTM E 903 - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.

F. ASTM G 26 - Standard Practice for Performing Accelerated Outdoor Weatherizing for Non-metallic Materials Using Concentrated Natural Sunlight.

1.4 PERFORMANCE REQUIREMENTS

A. Fire Performance: Surface burning characteristics when tested in accordance ASTM E 84:
   1. Flame Spread: 25, maximum.
   2. Smoke Developed: 450, maximum.

B. Abrasion Resistance: Film must have a surface coating that is resistant to abrasion such that, less than 5 percent increase of transmitted light haze will result in accordance with ASTM D 1044 using 50 cycles, 500 grams weight, and the CS10F Calbrase Wheel.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

D. Verification Samples: For each finish product specified, two samples representing actual product, color, and patterns.

E. Performance Submittals:
   1. Provide laboratory data of emissivity and calculated window U-Factors for various outdoor temperatures based upon established calculation procedure defined by the 1997 ASHRAE Handbook of Fundamentals, Chapter 29, or Lawrence Berkeley Laboratory Window 5.2 Computer Program.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten (10) years experience.

B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five (5) years demonstrated experience in installing products of the same type and scope as specified.
   1. Provide documentation that the installer is authorized by the Manufacturer to perform Work specified in this section.
   2. Provide a commercial building reference list of ____ (#) properties where the installer has applied window film. This list will include the following information:
      a. Name of building.
      b. The name and telephone number of a management contact.
      c. Type of glass.
      d. Type of film.
      e. Amount of film installed.
      f. Date of completion.
   3. Provide a Glass Stress Analysis of the existing glass and proposed glass/film combination as recommended by the film Manufacturer.
   4. Provide an application analysis to determine available energy cost reduction and savings.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Architect.
   2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
   3. Refinish mock-up area as required to produce acceptable work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 WARRANTY

A. At project closeout, provide to Owner or Owners Representative an executed current copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: 3M Window Film , which is located at: 3M Center Bldg. 0223-02-S-24 ; St. Paul, MN 55144-1000; Toll Free Tel: 888-364-3577; Tel: 651-737-1053 ; Fax: 651-736-0611; Email: windowfilm@mmm.com; Web: www.3m.com/windowfilm

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 SAFETYAND SECURITY WINDOW FILM

A. General:
1. 3M Ultra High Performance Safety and Security Window Films - SCARL 150, SCARL 400, and SCARL 600.
   a. Film Material - Clear: Optically clear micro-layered polyester film, laminated to additional clear micro-layered polyester film (Multi Layered), with a durable acrylic abrasion resistant coating over the surface. The film is clear and will not contain dyed polyester.
2. 3M Ultra High Performance Prestige Sun/Solar, Safety and Security Window Films - Ultra PR S70 and Ultra PR S50
   a. Optically clear, micro-layered, polyester film laminated to different clear multi-layered polyester film containing at least 220 layers with an acrylic pressure sensitive adhesive on one side and durable acrylic abrasion resistant coating on the other side. Films contain no metals, but so contain infared-absorbing carbon, metal oxide particles, or both.
3. 3M Ultra High Performance Sun/Solar, Safety and Security Window Films - S20SIAR400, S35NEAR400 and S50NEAR400
   a. Film Material - Optically clear multi-layered polyester film laminated to a metalized multi-layered polyester film, with a durable acrylic abrasion resistant coating over the surface. The film color is derived from the metal coating and the product will not contain dyed polyester.
4. 3M Ultra High Performance Sun/Solar, Safety,and Security Window Films - Ultra Night Vision S25NVAR400.

a. Film Material - Optically clear multi-layered polyester film laminated to a metalized multi-layered polyester film. Additional film layer is added for color and performance, with a durable acrylic abrasion resistant coating over the surface.

5. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
6. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
7. Identification: Labeled as to Manufacturer as listed in this Section.

B. Performance, SCLARL 150 - Ultra Prestige Safety and Security Window Film - Film applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
1. Film Color: Clear.
2. Thickness: Nominal 2.0 mils (0.1mm).
3. Emissivity: 0.87 when measured using a Devices & Services Emissometer Model AE at or near room temperature.
4. U-Factor: 1.09.
5. Visible Light Transmission (ASTM E 84): 87 percent.
6. Visible Reflection (ASTM E 903): Not more than 11 percent.
7. Ultraviolet Transmission (ASTM E 903): Less than 2 percent.
8. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): Not less than 0.92.
9. Tear Resistance (ASTM D 1004): Greater than 350 lbs.
10. Safety Rating: Category I (150 ft.-lbs).
11. Tensile Strength (ASTM D 882-95a): 30,000 psi.
12. Breaking Strength (Per Inch Width): 60 lbs.
13. Puncture Propagation Tear (ASTM D 2582-93): 2.0 lbs.
14. Young Modulus (ASTM D 882-95a): 500 kpsi nominal.
15. 3M Window Film Point of Contact - Michael Hassenauer 651-737-1053. Email: mjhassenauer@mmm.com.

C. Performance, SCLARL 400 - Ultra Prestige Safety and Security Window Film - Film applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
1. Film Color: Clear.
2. Thickness: Nominal 4.0 mils (0.2mm).
3. Emissivity: 0.87 when measured using a Devices & Services Emissometer Model AE at or near room temperature.
4. U-Factor: 1.09.
5. Visible Light Transmission (ASTM E 84): 86 percent.
6. Visible Reflection (ASTM E 903): Not more than 11 percent.
7. Ultraviolet Transmission (ASTM E 903): Less than 2 percent.
8. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): Not less than 0.91.
9. Tear Resistance (ASTM D 1004): Greater than 780 lbs.
10. Safety Rating: Category II (400 ft.-lbs).
11. Tensile Strength (ASTM D 882-95a): 30,000 psi.
12. Breaking Strength (Per Inch Width): 120 lbs.
13. Puncture Propagation Tear (ASTM D 2582-93): 7.5 lbs.
14. Young Modulus (ASTM D 882-95a): 500 kpsi nominal.
15. 3M Window Film Point of Contact - Michael Hassenauer 651-737-1053. Email: mjhassenauer@mmm.com.

D. Performance, Ultra 600 - Ultra Prestige Safety and Security Window Film - Film applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
1. Film Color: Clear.
2. Thickness: Nominal 6.0 mils (0.3mm).

3. Emissivity: 0.87 when measured using a Devices & Services Emissometer Model AE at or near room temperature.
4. U-Factor: 1.09.
5. Visible Light Transmission (ASTM E 84): 85 percent.
6. Visible Reflection (ASTM E 903): Not more than 10 percent.
7. Ultraviolet Transmission (ASTM E 903): Less than 2 percent.
8. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): Not less than 0.90.
9. Tear Resistance (ASTM D 1004): Greater than 1150 lbs.
10. Safety Rating: Category II (400 ft.-lbs).
11. Tensile Strength (ASTM D 882-95a): 30,000 psi.
12. Breaking Strength (Per Inch Width): 180 lbs.
13. Puncture Propagation Tear (ASTM D 2582-93): 19.2 lbs.
14. Young Modulus (ASTM D 882-95a): 500 kpsi nominal.
15. 3M Window Film Point of Contact - Michael Hassenauer 651-737-1053. Email: mjhassenauer@mmm.com.

E. Performance, Ultra PR 70 - Ultra Prestige Sun/Solar, Safety and Security Window Film - Film applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
1. Film Color: Clear Film with at least 220 plus layers.
2. Thickness: Nominal 6.0 mils (0.2mm).
3. Emissivity: 0.78 when measured using a Devices & Services Emissometer Model AE at or near room temperature.
4. U-Factor: .99.
5. Visible Light Transmission (ASTM E 84): 67 percent.
6. Visible Reflection (ASTM E 903): Not more than 10 percent.
7. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
8. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): Not less than 0.57.
9. Luminous Efficacy 1.18
10. Shading Coefficient - at 90 Degrees (normal incidence) - 57 percent
11. TSER - 60 Degree Angel - 49 percent
12. Tear Resistance (ASTM D 1004): Greater than 780 lbs.
13. Safety Rating: Category II (400 ft.-lbs).
14. Tensile Strength (Tensile_ASTM D 882-95a): 30,000 psi.
15. Breaking Strength (Per Inch Width): 120 lbs.
16. Puncture Propagation Tear (ASTM D 2582-93): 7.5 lbs.
17. Young Modulus (ASTM D 882-95a): 500 kpsi nominal.
18. 3M Window Film Point of Contact - Michael Hassenauer 651-737-1053. E-mail: mjhassenauer@mmm.com.

F. Performance, Ultra PR 50 - Ultra Prestige Sun/Solar, Safety and Security Window Film - Film applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
1. Film Color: Clear Film with at least 220 plus layers.
2. Thickness: Nominal 6.0 mils (0.2mm).
3. Emissivity: 0.78 when measured using a Devices & Services Emissometer Model AE at or near room temperature.
4. U-Factor: .99.
5. Visible Light Transmission (ASTM E 84): 49 percent.
6. Visible Reflection (ASTM E 903): Not more than 8 percent.
7. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
8. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): Not less than 0.97.
9. Luminous Efficacy .96
10. Shading Coefficient - at 90 Degrees (normal incidence) - 56 percent.
11. TSER - 60 Degree Angel - 63 percent.

12. Tear Resistance (ASTM D 1004): Greater than 780 lbs.
13. Safety Rating: Category II (400 ft.-lbs).
14. Tensile Strength (ASTM D 882-95a): 30,000 psi.
15. Breaking Strength (Per Inch Width): 120 lbs.
16. Puncture Propagation Tear (ASTM D 2582-93): 7.5 lbs.
17. Young Modulus (ASTM D 882-95a): 500 kpsi nominal.
18. 3M Window Film Point of Contact - Michael Hassenauer 651-737-1053. Email: mjhassenauer@mmm.com.

G. Performance, S20SIAR400 - Ultra Prestige Safety and Security Window Film - Film applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
1. Film Color: Tinted - Derived from metal coatings.
2. Thickness: Nominal 4.0 mils (0.2mm).
3. Emissivity: 0.79 when measured using a Devices & Services Emissometer Model AE at or near room temperature.
4. U-Factor: 1.02.
5. Visible Light Transmission (ASTM E 84): 19 percent.
6. Visible Reflection (ASTM E 903): Not more than 58 percent.
7. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
8. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): Not less than 0.26.
9. Tear Resistance (ASTM D 1004): Greater than 780 lbs.
10. Safety Rating: Category II (400 ft.-lbs).
11. Tensile Strength (ASTM D 882-95a): 30,000 psi.
12. Breaking Strength (Per Inch Width): 120 lbs.
13. Puncture Propagation Tear (ASTM D 2582-93): 7.5 lbs.
14. Young Modulus (ASTM D 882-95a): 500 kpsi nominal.
15. 3M Window Film Point of Contact - Michael Hassenauer 651-737-1053. Email: mjhassenauer@mmm.com.

H. Performance, S35NEAR40 - Ultra Prestige Safety and Security Window Film - Film applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
1. Film Color: Tinted - Derived from metal coatings.
2. Thickness: Nominal 4.0 mils (0.2mm).
3. Emissivity: 0.87 when measured using a Devices & Services Emissometer Model AE at or near room temperature.
4. U-Factor: 1.09.
5. Visible Light Transmission (ASTM E 84): 37 percent.
6. Visible Reflection (ASTM E 903): Not more than 20 percent.
7. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
8. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): Not less than 0.51.
9. Tear Resistance (ASTM D 1004): Greater than 780 lbs.
10. Safety Rating: Category II (400 ft.-lbs).
11. Tensile Strength (ASTM D 882-95a): 30,000 psi.
12. Breaking Strength (Per Inch Width): 120 lbs.
13. Puncture Propagation Tear (ASTM D 2582-93): 7.5 lbs.
14. Young Modulus (ASTM D 882-95a): 500 kpsi nominal.
15. 3M Window Film Point of Contact - Michael Hassenauer 651-737-1053. Email: mjhassenauer@mmm.com.

I. Performance, S50NEAR4000 - Ultra Prestige Safety and Security Window Film - Film applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
1. Film Color: Tinted - Derived from metal coatings.
2. Thickness: Nominal 4.0 mils (0.2mm).
3. Emissivity: 0.87 when measured using a Devices & Services Emissometer

Model AE at or near room temperature.
4. U-Factor: 1.09.
5. Visible Light Transmission (ASTM E 84): 51 percent.
6. Visible Reflection (ASTM E 903): Not more than 15 percent.
7. Ultraviolet Transmission (ASTM E 903): Less than 2 percent.
8. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): Not less than 0.66.
9. Tear Resistance (ASTM D 1004): Greater than 780 lbs.
10. Safety Rating: Category II (400 ft.-lbs).
11. Tensile Strength (ASTM D 882-95a): 30,000 psi.
12. Breaking Strength (Per Inch Width): 120 lbs.
13. Puncture Propagation Tear (ASTM D 2582-93): 7.5 lbs.
14. Young Modulus (ASTM D 882-95a): 500 kpsi nominal.
15. 3M Window Film Point of Contact - Michael Hassenauer 651-737-1053. Email: mjhassenauer@mmm.com.

J. Performance, S25NVAR4000 - Ultra Prestige Safety and Security Window Film - Film applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
1. Film Color: Tinted - Derived from metal coatings.
2. Thickness: Nominal 5.0 mils (0.2mm).
3. Emissivity: 0.72 when measured using a Devices & Services Emissometer Model AE at or near room temperature.
4. U-Factor: .82.
5. Visible Light Transmission (ASTM E 84): 24 percent.
6. Visible Reflection (ASTM E 903): Not more than 28 percent.
7. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
8. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): Not less than 0.43.
9. Tear Resistance (ASTM D 1004): Greater than 780 lbs.
10. Safety Rating: Category II (400 ft.-lbs).
11. Tensile Strength (Tensile_ASTM D 882-95a): 30,000 psi.
12. Breaking Strength (Per Inch Width): 120 lbs.
13. Puncture Propagation Tear (ASTM D 2582-93): 7.5 lbs.
14. Young Modulus (ASTM D 882-95a): 500 kpsi nominal.
15. 3M Window Film Point of Contact - Michael Hassenauer 651-737-1053. Email: mjhassenauer@mmm.com.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Cut film edges neatly and square at a uniform distance of 1/8 inch (3 mm) to 1/16 inch (1.5 mm) of window sealant. Use new blade tips after 3 to 4 cuts.

C. Spray the slip solution, composed of one capful of baby shampoo or dishwashing liquid to 1 gallon of water, on window glass and adhesive to facilitate proper positioning of film.

D. Apply film to glass and lightly spray film with slip solution.

E. Squeegee from top to bottom of window. Spray slip solution to film and squeegee a second time.

F. Bump film edge with lint-free towel wrapped around edge of a 5-way tool.

G. Upon completion of film application, allow 30 days for moisture from film installation to dry thoroughly, and to allow film to dry flat with no moisture dimples when viewed under normal viewing conditions.

3.4 CLEANING AND PROTECTION

A. Remove left over material and debris from Work area. Use necessary means to protect film before, during, and after installation.

B. Touch-up, repair or replace damaged products before Substantial Completion.

C. After application of film, wash film using common window cleaning solutions, including ammonia solutions, 30 days after application. Do not use abrasive type cleaning agents and bristle brushes to avoid scratching film. Use synthetic sponges or soft cloths.

END OF SECTION

SECTION 08 91 00

LOUVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Louvers, frames, and accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

B. Section 01 6000 - Product Requirements: Substitution procedures.

C. Section 07 6200 - Sheet Metal Flashing and Trim.

D. Section 07 9200 - Joint Sealants.

E. Division 23 - Ducts: Ductwork attachment to louvers.

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2005.

B. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; Air Movement and Control Association International, Inc.; 2007.

C. AMCA 511 - Certified Ratings Program for Air Control Devices; Air Movement and Control Association International, Inc.; 2010.

D. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2007.

E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2008.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.

C. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, tolerances; head, jamb and sill details; blade configuration, screens, blankout areas required, and frames.

D. Samples: Submit two samples 2 by 2 inches in size illustrating finish and color of exterior surfaces.

E. Test Reports: Independent agency reports showing compliance with specified performance criteria.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of experience.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide twenty year manufacturer warranty against distortion, metal degradation, and failure of connections.
   1. Finish: Include coverage against degradation of exterior finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wall Louvers:
   1. Airolite Company, LLC: www.airolite.com.
   2. American Warming and Ventilating: www.awv.com.
   3. Construction Specialties, Inc: www.c-sgroup.com.
   4. Industrial Louvers, Inc.: www.industriallouvers.com.
   5. Substitutions: See Section 01600 - Product Requirements.

2.02 LOUVERS

A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified under AMCA 511.
   1. Wind Load Resistance: Design to resist positive and negative wind load of 25 psf minimum, without damage or permanent deformation.
   2. Intake Louvers: Design to allow maximum of 0.01 oz/sq ft water penetration at calculated intake design velocity based on design air flow and actual free area, when tested in accordance with AMCA 500-L.
   3. Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.
   4. Screens: Provide insect screen at intake louvers and bird screens at exhaust louvers.

B. Stationary Louvers: Horizontal blade, extruded aluminum construction.
   1. Basis of Design: Airolite K609HP.
   2. Free Area: 52%, minimum.
   3. Blades: Drainable.
   4. Frame: 4 inches deep, channel profile; corner joints mitered and mechanically fastened, with continuous recessed caulking channel each side.
   5. Metal Thickness: Frame 0.081 inch; blades 0.081 inch.
   6. Finish: Fluoropolymer coating, finished after fabrication.
      a. 3-Coat fluoropolymer finish, 2.0 mils dry-film coating thickness that meets or exceeds the performance requirements of AAMA 2605.
   7. Color: Custom, to match approved sample. Match existing green louver color

2.03 MATERIALS

A. Extruded Aluminum: ASTM B221,

B. Bird Screen: Interwoven wire mesh of aluminum, 0.063 inch diameter wire, 1/2 inch open weave, diagonal design.

C. Insect Screen: 18 x 16 size aluminum mesh.

2.04 PROTECTIVE COATINGS

A. Protect finished Work from staining and corrosion as follows:
   1. Separate aluminum from direct contact with metals other than stainless steel, zinc, cadmium, or nickel bronze by painting contact surfaces with zinc chromate primer and aluminum paint or with a coat of heavy-bodied bituminous paint or by non-absorptive tape or gaskets.
   2. Paint exterior aluminum in contact with wood, concrete or masonry with zinc chromate primer and aluminum paint or heavy-bodied bituminous paint.

2.05 ACCESSORIES

A. Blank-Off Panels: Same material as louver, painted black on exterior side; provide where duct connected to louver is smaller than louver frame, sealing off louver area outside of duct and where duct is not connected to louver.

B. Screens: Frame of same material as louver, with mitered and welded corners; removable, screw attached; installed on inside face of louver frame.

C. Fasteners and Anchors: Stainless steel.

D. Flashings: Of same material as louver frame, formed to required shape, single length in one piece per location.

E. Frame Stiffeners: Of same material as louver frame, for openings more than 6 feet in width and a maximum spacing of 6 feet, unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared openings and flashings are ready to receive work and opening dimensions are as indicated on shop drawings.

B. Verify that field measurements are as indicated on shop drawings.

3.02 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Install louvers level and plumb.

C. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.

D. Secure louver frames in openings with concealed fasteners.

E. Install perimeter sealant and backing rod in accordance with Section 07900.

F. Coordinate with installation of mechanical ductwork.

3.03 CLEANING

A. Strip protective finish coverings.

B. Clean surfaces and components.

END OF SECTION

SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Metal stud wall framing.

C. Metal channel ceiling framing.

D. Shaftwall systems.

E. Acoustic insulation.

F. Gypsum sheathing.

G. Gypsum wallboard.

H. Joint treatment and accessories.

I. Framing accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

B. Section 01 6000 - Product Requirements: Substitution procedures.

C. Section 05 4000 - Cold-Formed Metal Framing: Exterior wind-load-bearing metal stud framing.

D. Section 06 1000 - Rough Carpentry: Wood sheathing and blocking.

E. Section 07 2100 - Thermal Insulation.

F. Section 07 2500 - Weather Barriers: Water-resistive barrier over sheathing.

G. Section 07 8400 - Firestopping: Top-of-wall assemblies at fire rated walls.

H. Section 07 8100 - Applied Fireproofing.

I. Section 07 9200 - Joint Sealants: Acoustic sealant.

I. Section 09 9100 – Painting and Finishing.

1.03 REFERENCE STANDARDS

A. AISI SG02-1 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2001 with 2004 supplement. (replaced SG-971)

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.

C. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2002 (Reapproved 2007).

D. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2011a.

E. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.

F. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2011.

G. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2011.

H. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2011.

I. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2007.

J. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2010a.

K. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2008.

L. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2011.

M. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2012.

N. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2012.

O. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009.

P. ASTM E 136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C, 2004.

Q. ASTM E413 - Classification for Rating Sound Insulation; 2010.

R. GA-216 - Application and Finishing of Gypsum Board; Gypsum Association; 2010.

S. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Indicate anchorage to structure, accessories, and items of other related work.
   2. Describe method for securing studs to tracks, splicing, and for blocking and reinforcement of framing connections.

C. Product Data: Provide data on metal framing, gypsum board, glass mat faced gypsum board, accessories, and joint finishing system.

D. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing gypsum board application and finishing, with minimum 3 years of experience.

B. Walls over 14 feet tall, metal framed gypsum board ceilings and seismic bracing shall be designed under the direct supervision of a Professional Engineer experienced in design of this work and licensed in the State of Tennessee.

1.06 PROJECT CONDITIONS

A. Coordinate the placement of components to be installed within stud framing.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.
   1. See PART 3 for finishing requirements.

B. Interior Partitions: Provide completed assemblies with the following characteristics:
   1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

C. Fire Rated Assemblies: Provide completed assemblies with the following characteristics:
   1. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL Fire Resistance Directory.
   2. Fire Rated Assemblies: Provide completed assemblies as shown on drawings and complying with applicable codes

2.02 METAL FRAMING MATERIALS

A. Manufacturers - Metal Framing, Connectors, and Accessories:

1. Clarkwestern Dietrich Building Systems LLC: www.clarkdietrich.com.
2. Phillips Manufacturing Company: www.phillipsmfg.com.
3. Substitutions: See Section 01 6000 - Product Requirements.

B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
   1. Exception: The minimum metal thickness and section properties requirements of ASTM C 645 are waived provided steel of 40 ksi minimum yield strength is used, the metal is continuously dimpled, the effective thickness is at least twice the base metal thickness, and maximum stud heights are determined by testing in accordance with ASTM E 72 using assemblies specified by ASTM C 754.
   2. Studs: "C" shaped with flat or formed webs with knurled faces.
      a. Thickness: 25 gage.
      b. Thickness: minimum 20 gage behind cementitious backer board.
   3. Runners: U shaped, sized to match studs. Provide deep tracks at head to allow for building movement. Refer to deflection track paragraphs below.
   4. Ceiling Channels: C shaped, 1-1/2" deep galvanized steel.
   5. Furring: Hat-shaped sections, minimum depth of 7/8 inch.
   6. Resilient Furring Channels: 1/2 inch depth, for attachment to substrate through one leg only.

C. Loadbearing Studs for Application of Gypsum Board: As specified in Section 05 4000.

D. Shaft Wall Studs and Accessories: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754.

E. Ceiling Hangers: Type and size as specified in ASTM C 754 for spacing required. Minimum 8 gage hanger wires and 16 gage tie wires, galvanized.

F. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition. The amount of deflection shall be calculated as L/360, where L equals the distance in inches between columns or other structural supports. Deflection shall not exceed 1 inch.
   1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI North American Specification for the Design of Cold-Formed Steel Structural Members.
   2. Material: ASTM A653 steel sheet, SS Grade 50/340, with G60/Z180 hot dipped galvanized coating.
   3. Provide components UL-listed for use in UL-listed fire-rated head of partition joint systems of fire rating and movement required.
   4. Deflection and Firestop Track:
      a. Provide mechanical anchorage devices as described above that accommodate deflection while maintaining the fire-rating of the wall assembly.
      b. Acceptable Products:
         1) "Posi Clip" by Fire Trak Corporation.
         2) "The System" by Metal-Lite, Inc.

G. Non-Fire Rated Assemblies:
   1. Deflection Track: Provide U shaped track fastened to structure with legs of sufficient length to accommodate vertical deflection of the structure; width of track to match studs. Cut studs and gypsum board short of top of track to allow for deflection. Attachment of studs to deflection track shall allow for the required deflection. One of the following methods shall be used unless indicated otherwise:
      a. Slotted Track: Provide deep leg track with vertical slots a minimum of 1 inch on center. Slots shall be designed for placement of anchors through track to stud, allowing for vertical differential movement between track and stud. Slotted track to be equal to Brady Construction Innovations SLP TRK system by Dietrich Metal Framing.

b. Slotted Clip Angles Attached to Track: Anchor studs to deep leg track with vertically slotted clip angles. Clip angles to be attached to studs through slots that will allow for vertical movement. Permanently attach clip angles to track. Clip angles equal to VertiClip SL by Steel Network Inc. or Fast Top Clip by Dietrich Metal Framing.
c. Slotted Clip Stud Flange and Vertical Leg of Track: Slotted clips attached to inside face of ceiling track with two #6 tek screws; two clips per stud. Clips are to engage stud flange with attachment through slots allowing for vertical movement. Slotted clips to be equal to Posi Clip by Fire Trak Corp. Use 16 gage clips at door jambs and 20 gage clips at all other locations.
d. Friction fit studs in deflection track and brace studs by methods equal to those indicated below:
    1) Install minimum 1-1/2 inch cold-rolled channel in top knock-out of studs running parallel to stud wall. Attach channel to studs with a clip angle using two tek screws at each stud and two tek screws at channel. Screws at stud are to be attached on both sides of knock-out or 9200 Spazzer Bracing and Bridging Bar by Dietrich Metal Framing. Provide 16 gage slotted clips at door jambs.
    2) Install notched channel in top knock-out of studs and anchor with angle clips. Notched channel and clips to be equal to BridgeClip by Steel Network Inc. Provide 16 gage slotted clips at door jambs.

H. Fire Rated Assemblies:
1. Deflection Track: Provide U shaped track fastened to structure with legs of sufficient length to accommodate deflection; width of track to match studs. Cut studs short of top of track and as recommended by manufacturer to allow for deflection. Track to be equal to Shadowline by Fire Trak Corp. width of flange offset to accommodate thickness of gypsum board.
    a. At shaftwall and chase wall construction, deflection track is to be equal to Cavity Shadowline by Fire Trak Corp.
    b. Attachment of studs at deflection track to be per manufacturer's recommendations.
    c. Provide components UL-listed for use in UL-listed fire-rated head of partition joint systems.
2. Optional Deflection Track at Fire rated Assemblies: Provide U shaped track and assembly as indicated under Non-Fire Rated Assemblies above. Extend gypsum board to within a distance of the structure above that will allow for deflection of structure. Provide UL approved firestop system at joint between gypsum board and structure that will allow for movement of structure above. Firestop shall match or exceed the partition fire rating. Deflection track and firestop system are to be approved by the local building authority and reviewed by the Architect prior to construction.

I. Tracks and Runners: Same material and thickness as studs, bent leg retainer notched to receive studs with provision for crimp locking to stud.

J. Furring and Bracing Members: Of same material as studs; thickness to suit purpose; complying with applicable requirements of ASTM C 754.

K. Fasteners: ASTM C 1002 self-piercing tapping screws.

L. Reinforcing Plates/In-Wall Blocking: Provide 20 gage x 6 inch high continuous steel plates for blocking at wall mounted equipment and millwork anchored to wall.

M. Anchorage Devices: Power actuated.

N. Touch-up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic.

2.03 FABRICATION

A. Fabricate assemblies of framed sections to sizes and profiles required.

B. Fit, reinforce and brace framing members to suit design requirements.

2.04 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:

1. CertainTeed Corporation: www.certainteed.com.
2. National Gypsum Company: www.nationalgypsum.com.
3. USG Corporation: www.usg.com.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated below or on the drawings.
   2. Glass-mat-faced gypsum panels as defined in ASTM C1658, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
   3. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
   4. Thickness:
      a. Vertical Surfaces: 5/8 inch.
      b. Ceilings: 5/8 inch.
      c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.

C. Water and Mold/Mildew Resistant Gypsum Wallboard: (Not for Use at Wet Walls): ASTM C 1396, ASTM E 84 and ASTM E 136; ends square cut.
   1. Thickness: 5/8 inch.
   2. Core: Regular and Type X.
   3. Products:
      a. National Gypsum Company: Gold Bond XP Wallboard.
      b. USG: Mold Tough Wallboard.
      c. CertainTeed Corporation; ProRoc Brand Moisture & Mold Resistant Gypsum Board.
      d. See fiberglass faced board materials below for glass mat products used at same application.
   4. Application:
      a. Inside surface of all exterior walls.
      b. Behind thinset tile, except in wet areas.

D. Exterior Sheathing Board: Sizes to minimize joints in place; ends square cut.
   1. Application: Exterior sheathing, unless otherwise indicated.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   3. Glass-Mat-Faced Sheathing: Glass mat faced gypsum substrate as defined in ASTM C1177/C1177M.
   4. Core Type: Regular.
   5. Regular Board Thickness: 1/2 inch or as noted on the drawings.
   6. Edges: As required for horizontal or vertical applications.
   7. Glass-Mat-Faced Products:
      a. CertainTeed Corporation; GlasRoc Brand.
      b. Georgia-Pacific Gypsum; DensGlass Sheathing.
      c. National Gypsum Company; Gold Bond Brand eXP Extended Exposure Sheathing.
      d. Substitutions: See Section 01 6000 - Product Requirements.

E. Shaftwall and Coreboard: Type X; 1 inch thick by 24 inches wide, beveled long edges, ends square cut.
   1. Paper Faced Type: Gypsum shaftliner board or gypsum coreboard as defined ASTM C1396; water-resistant faces.
   2. Glass-Mat Faced Type: Glass-mat shaftliner gypsum panel or glass-mat coreboard gypsum panel as defined in ASTM C1658.

F. Glass-Mat Faced Type: Gypsum panels with moisture-resistant core and coated inorganic fiberglass mat back surface designed to resist growth of mold and mildew, per ASTM D3273.
   1. Glass-Mat Board: Comply with performance requirements of ASTM C1396 for water-resistant gypsum backing board and ASTM C1177 for sheathing; tapered long edges.
   2. Thickness: 5/8 inch.

3. Core: Regular and Type X.
4. Products:
    a. USG: Fiberock Aqua-Tough Tile Backer Board.
    b. G-P Gypsum Products: DensArmor Plus.
    c. Substitutions: See Section 01600 - Product Requirements.
    d. Applications:
        1) Interior side of exterior walls.
        2) Tile backer board in dry areas.

G. Coated Glass-Mat Backer Board: ASTM C1178, with coated inorganic fiberglass mat on both surfaces and integral acrylic coating vapor retarder.
1. Thickness: 5/8 inch.
2. Core: Regular.
3. Products:
    a. G-P Gypsum Products: DensShield Tile Backer.
    b. CertainTeed: Diamondback GlasRoc Tile Backer.
    c. Substitutions: See Section 01 6000 - Product Requirements
4. Applications:
    a. Janitor Closets.

2.05 ACCESSORIES

A. Acoustic Insulation: ASTM C665, Type I; preformed glass fiber, friction fit type, unfaced. Thickness: 3-1/2 inches.

B. Acoustic Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board.
1. Acrylic, latex based sound caulk for use as a joint sealant in fire-rated partitions, smoke barriers and sound-rated assemblies.

C. Finishing Accessories: ASTM C1047, galvanized steel or rolled zinc, unless otherwise indicated.
1. Types: As detailed or required for finished appearance.
2. Special Shapes: In addition to conventional cornerbead and control joints, provide U-bead at exposed panel edges.

D. Joint Materials: ASTM C475 and as recommended by gypsum board manufacturer for project conditions.
1. Tape: 2 inch wide, coated glass fiber tape for joints and corners.
2. Ready-mixed vinyl-based joint compound.
3. Chemical hardening type compound.

E. Screws for Attachment to Steel Members Less Than 0.03 inch In Thickness, to Wood Members, and to Gypsum Board: ASTM C1002; self-piercing tapping type; cadmium-plated for exterior locations.

F. Screws for Attachment to Steel Members From 0.033 to 0.112 Inch in Thickness: ASTM C954; steel drill screws for application of gypsum board to loadbearing steel studs.

G. Decals For Identification of Fire Rated and Smoke Partitions: Minimum 3 inch high, red letters for identification of hourly rating and smoke separation partitions. Example; "TWO HOUR FIRE BARRIER, PROTECT ALL OPENINGS". Decals shall provide permanent identification of partitions. Contractor to verify verbiage and size of letters with local code authorities prior to installation.
1. Painted letters installed with a template shall be acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

B. Verify that rough-in utilities are in proper location.

3.02 SHAFT WALL INSTALLATION

A. Shaft Wall Framing: Install in accordance with manufacturer's installation instructions.
   1. Install studs at spacing required to meet performance requirements.

B. Shaft Wall Liner: Cut panels to accurate dimension and install sequentially between special friction studs.
   1. On walls over sixteen feet high, screw-attach studs to runners top and bottom.
   2. Seal perimeter of shaft wall and penetrations with acoustical, fire retardant sealant.

3.03 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
   1. Level ceiling system to a tolerance of 1/1200.
   2. Laterally brace entire suspension system.
   3. Install suspension system in compliance with seismic requirements of the 2009 IBC.

C. Studs: Space studs at 16 inches on center.
   1. Extend partition framing to deck where noted and minimum 6 inches above ceiling in other locations.
   2. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.

D. Align and secure top and bottom runners at 24 inches on center.

E. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.

F. Align stud web openings horizontally.

G. Secure studs to tracks using crimping method. Do not weld.

H. Stud splicing is not permissible.

I. Fabricate corners using a minimum of three studs.

J. Brace stud framing system rigid.

K. Coordinate erection of studs with requirements of door frames.

L. Coordinate installation of bucks, anchors and blocking with electrical and mechanical work to be placed within or behind stud framing.

M. Double stud at wall openings, door and window jambs, not more than 2 inches from each side of openings.

N. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

O. Blocking: Install mechanically fastened steel sheet blocking or wood blocking for support of:
   1. Framed openings.
   2. Wall mounted items.
   3. Plumbing fixtures.
   4. Toilet partitions.
   5. Toilet accessories.
   6. Wall mounted door hardware.
   7. And other areas requiring wall blocking.

P. Drywall Contractor shall be responsible for installing corner and “T” framing inside the framing of the Prefabricated Wall Panel System at all intersections of interior partitions at exterior walls.

3.04 CEILING AND SOFFIT FRAMING

A. Comply with requirements of ASTM C754.

B. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.

C. Install furring independent of walls, columns and above-ceiling work.

D. Securely anchor hangers to structural members or embed in structural slab. Space hangers as required to limit deflection to criteria indicated. Use rigid hangers at exterior soffits.

E. Space main carrying channels at maximum 72 inch on center and not more than 6 inches from wall surfaces. Lap splice securely.

F. Securely fix carrying channels to hangars to prevent turning or twisting and to transmit full load to hangers.

G. Place furring channels perpendicular to carrying channels, not more than 2 inches from perimeter walls and rigidly secure. Lap splices securely.

H. Laterally brace suspension system.

I. Reinforce openings in suspension system which interrupt main carrying channels or furring channels with lateral bracing. Extend bracing minimum 24 inches past each opening.

3.05 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install as follows:
   1. Place one bead continuously on substrate before installation of perimeter framing members.
   2. Place continuous bead at perimeter of each layer of gypsum board.
   3. In non-fire-rated construction, seal around all penetrations by conduit, pipe, ducts, and rough-in boxes.

3.06 ERECTION TOLERANCES

A. Maximum Variation From True Plane: 1/8 inch in 10 feet.

B. Maximum Variation From Plumb: 1/8 inch in 10 feet

3.07 BOARD AND GLASS MAT FACED BOARD INSTALLATION

A. Comply with ASTM C 840 and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

D. Installation on Metal Framing: Use screws for attachment of all gypsum board.

3.08 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as follows:
   1. Not more than 30 feet apart on walls and ceilings over 50 feet long.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.

3.09 JOINT TREATMENT

A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, bedded and finished with chemical hardening type joint compound.

B. Paper Faced Gypsum Board: Use fiberglass joint tape, bedded with ready-mixed vinyl-based joint compound and finished with ready-mixed vinyl-based joint compound.

C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.

2. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
3. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.

D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
1. Feather coats of joint compound so that camber is maximum 1/32 inch.
2. Taping, filling, and sanding is not required at surfaces behind adhesive applied ceramic tile.

3.10 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09 21 16.23

GYPSUM BOARD SHAFT WALL ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Gypsum board shaft wall assemblies.

1.2 ACTION SUBMITTALS

A. Product Data: For each component of gypsum board shaft wall assemblies.

B. Sustainable Design Submittals:

~~1. Product Data: For recycled content, indicating percentage of postconsumer and preconsumer recycled content and cost.~~
~~2. Health Product Declaration (HPD): Provide documentation indicating that manufacturer has screened and publicly provided ingredient disclosure to 1000 ppm, and has developed an action plan to mitigate known hazards.~~
~~3. Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each indigenous material.~~
~~4. Laboratory Test Reports: For ceiling and wall materials, indicating compliance with requirements for low-emitting materials.~~
~~5. Laboratory Test Reports: For ceiling and wall materials, indicating compliance with requirements for low-emitting materials.~~

1.3 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: From Underwriters Laboratories showing compliance with Project requirements, for the following:

1. Studs and track.
2. Equivalent corrosion-resistant coating on steel framing.
3. Firestop track.
4. Post-installed anchors.
5. Power-actuated fasteners.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage.

B. Stack shaftliner and face panels flat and support them on risers on a flat platform to prevent sagging.

C. Protect steel framing from corrosion, deformation, and other damage during delivery, storage, and handling in accordance with AISI S202.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with gypsum-shaftliner-board manufacturer's written instructions.

B. Do not install finish panels until installation areas are enclosed and conditioned.

C. Do not install shaftliner and face panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: Provide materials and construction identical to rated assembly indicated on Drawings tested in accordance with ASTM E119 by an independent testing agency.

B. STC-Rated Assemblies: Provide materials and construction identical to rated assembly indicated on Drawings tested in accordance with ASTM E90 and classified in accordance with ASTM E413 by a testing and inspecting agency.

~~C. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert number>** percent.~~

~~D. Product Data: Verify materials were manufactured within **100 miles** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **100 miles** of Project site.~~

~~E. Regional Materials: Verify materials were manufactured within **500 miles** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles** of Project site. If materials are transported by rail or water, multiply the distance by 0.25 to determine the distance to Project site.~~

2.2 GYPSUM BOARD SHAFT WALL ASSEMBLIES

A. Fire-Resistance Rating: ~~As indicated on Drawings1 hour~~2 hours~~3 hours4 hoursInsert rating~~.

B. Minimum STC Rating: 41.

C. Gypsum Shaftliner Board:

D. Steel Framing, General: Complying with applicable requirements in AISI S220 and complying with requirements for fire-resistance-rated assemblies indicated on Drawings.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CEMCO; California Expanded Metal Products Co.: CH Shaftwall Stud System
b. ClarkDietrich

2. Basis-of-Design Product: Subject to compliance with requirements, provide CEMCO; California Expanded Metal Products Co.: CH Shaftwall Stud System or comparable product by one of the following:

a. CEMCO; California Expanded Metal Products Co.: CH Shaftwall Stud System
b. ClarkDietrich

3. Protective Coating: **ASTM A653/A653M, or coating with demonstrated equivalent corrosion resistance. Galvannealed products are unacceptable.**

a. Equivalent Corrosion Resistance: Evaluation report acceptable to authorities having jurisdiction demonstrates corrosion resistance equivalent to specified protective coating.

E. Studs: Profiles required for fire-resistance-rated assembly indicated on Drawings for repetitive, corner, and end members as follows:

1. Depth: ~~As indicated on Drawings~~2-1/2 inches4 inches~~6 inches~~.
2. Minimum Base-Steel Thickness: As indicated on Drawings.

F. Track: J-profile track required for fire-resistance-rated assembly indicated on Drawings with minimum long-leg length of 2 inches and matching studs in depth.

1. Minimum Base-Steel Thickness: Matching studs.

G. Elevator-Hoistway-Entrance Struts: Manufacturer's standard jamb strut with "J" profile and long-leg length of 3 inches, matching studs in depth, and with minimum 0.0329-inch base-steel thickness.

H. Finish Panels: As indicated on Drawings**.**

I. Sound Attenuation Blankets: As specified in Section 092900 "Gypsum Board"**.**

2.3 ACCESSORIES

A. Provide accessories that comply with shaft wall manufacturer's written instructions.

B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes as specified in Section 092900 "Gypsum Board" that comply with shaft wall assembly manufacturer's written instructions for application indicated on Drawings.

C. Steel Drill Screws: ASTM C1002 unless otherwise indicated on Drawings.

D. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.

1. Expansion Anchors: Fastener systems with an evaluation report, acceptable to authorities having jurisdiction, based on ICC-ES **AC01 or AC193** as appropriate for the substrate.
2. Power-Actuated Anchors: Fastener systems with an evaluation report, acceptable to authorities having jurisdiction, based on ICC-ES AC70.

E. Reinforcing: Steel reinforcing strips of corrosion-resistant steel complying with steel framing requirements and in **0.0329-inch** minimum base-steel thickness.

F. Acoustical Sealant: As specified in Section 079219 "Acoustical Joint Sealants."

~~1. Product Data: Verify architectural sealant has a VOC content of 250 g/L or less.~~

G. Gypsum Board Cants:

1. Gypsum Board Panels: As specified in Section 092900 "Gypsum Board," [**Type X, 5/8-inch** panels.
2. Adhesive: Laminating adhesive as specified in Section 092900 "Gypsum Board."
3. Non-Structural Steel Framing: As specified in Section 092216 "Non-Structural Metal Framing."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine shaftliner and face panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordination with Sprayed Fire-Resistive Materials:

1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or top track to surfaces indicated to receive sprayed fire-resistive materials unless otherwise indicated on Drawings. Where offset anchor plates are required, provide continuous plates fastened to building structure as required by fire-resistance-rated assembly but not more than **24 inches** o.c.
2. After sprayed fire-resistive materials are applied, remove only to extent necessary for installation of shaft wall assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated on Drawings. Protect remaining fire-resistive materials from damage.
3. Patch or replace sprayed fire-resistive materials removed or damaged during installation of shaft wall assemblies to comply with requirements specified in Section 078100

"Applied Fire Protection."

3.3 INSTALLATION OF GYPSUM BOARD SHAFT WALL ASSEMBLIES

A. General: Install shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated on Drawings and manufacturer's written installation instructions.

B. Do not bridge building expansion joints with shaft wall assemblies; frame both sides of expansion joints with furring and other support.

C. Install supplementary framing in shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.

1. Elevator Hoistway: At elevator hoistway-entrance door frames, provide jamb struts on each side of door frame.
2. Reinforcing: Provide where items attach directly to shaft wall assembly as indicated on Drawings; accurately position and secure behind at least one layer of face panel.

D. Penetrations: At penetrations in shaft wall assemblies, maintain fire-resistance rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons and floor indicators, and similar items.

E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels while maintaining continuity of fire-rated construction.

F. Firestop Track: Where indicated on Drawings, install to maintain continuity of fire-resistance-rated assembly.

G. Control Joints: Install control joints at locations indicated on Drawings and in accordance with ASTM C840 and in specific locations approved by Architect while maintaining fire-resistance rating of shaft wall assemblies.

H. Sound-Rated Shaft Wall Assemblies: Seal with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly.

I. Gypsum Board Cants: At projections into shaft **exceeding 4 inches where indicated on Drawings**, or in specific locations directed by the Architect. Install gypsum board cants covering tops of projections.

1. Slope cant panels at least 75 degrees from horizontal. Set base edge of panels in adhesive and secure top edges to shaft walls at **24 inches** o.c. with screws fastened to shaft wall framing.
2. Where non-structural steel framing is required to support gypsum board cants, install framing at **24 inches** o.c. and extend studs from the projection to shaft wall framing.

J. Installation Tolerance: Install each framing member so fastening surfaces vary not more than **1/8 inch** from the plane formed by faces of adjacent framing.

3.4 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace shaftliner and face panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

Armstrong World Industries, Inc.

Ceiling & Suspension System Specification

Please understand that you are responsible for the accuracy of all project specifications, including any Armstrong guide specifications that you use.

ARMSTRONG SHALL NOT BE LIABLE FOR ANY DAMAGES ARISING OUT OF THE USE OF ANY OF ITS GUIDE SPECIFICATIONS.

SECTION 09 22 26.23 (09120)

METAL SUSPENSION SYSTEMS

Drywall Flat or Curved Applications

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general conditions of Contract, including General and Supplementary Conditions and Divisions-1 Specification sections apply to work of this section.

1.2 SUMMARY

A. Section Includes:
   1. Suspension System Framing and Furring for Plaster and Gypsum Board Assemblies
   2. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.

B. Related Sections:
   1. Section 09250 - Gypsum Board
   2. Section 09150 - Acoustical Ceilings
   3. Division 15 Sections - Mechanical Work
   4. Division 16 Sections - Electrical Work

C. Alternates
   1. Prior Approval: Unless otherwise provided for in the Contract documents, proposed product substitutions may be submitted no later than TEN (10) working days prior to the date established for receipt of bids. Acceptability of a proposed substitution is contingent upon the Architect's review of the proposal for acceptability and approved products will be set forth by the Addenda. If included in a Bid are substitute products that have not been approved by Addenda, the specified products shall be provided without additional compensation.
   2. Submittals, which do not provide adequate data for the product evaluation, will not be considered. The proposed substitution must meet all requirements of this section, including but not necessarily limited to, the following: Single source materials suppliers (if specified in Section 1.5); Furring System component profiles and sizes; Compliance with the referenced standards.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.

2. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
3. ASTM A 1003 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability"
4. ASTM B 117 Standard Practice for Operating Salt Spray (Fog) Apparatus
5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
6. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
7. ASTM C 645 Standard Specification for Nonstructural Steel Framing Members
8. ASTM C 754 Installation of Steel Framing Members to Receive Screw-Attached Gypsum Board
9. ASTM C 840 Specification for Application & Finishing of Gypsum Board
10. ASTM C 1858 Standard Practice for Design, Construction, and Material Requirements for Direct Hung Suspended T-bar Type Ceiling Systems Intended to Receive Gypsum Panel Products in Areas Subject to Earthquake Ground Motions
11. ASMT C 1925, Standard Test Method for Strength properties of Direct Hung, Suspended T bar ceilings system intended to receive gypsum board.
12. ASTM C 1002 Standard Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases.
13. ASTM D 610 Standard Test Method for Evaluating Degree of Rusting on Painted Steel Surfaces
14. ASTM E 119 Standard Test Method for Fire Tests of Building Construction and Material (if applicable).
15. ASTM E 3090, Standard Test Method of Metal Ceiling Suspension Systems
16. NOA #07-0119.02 Miami/Dade Wind Uplift.
17. NAO #09-0512.02 Miami/Dade Impact.
18. ESR-1289 ICC-ES Evaluation Report.
19. CISCA Ceiling Systems Installation Handbook
20. (Underwriters Laboratories Inc. (UL) Fire Resistance Directory)

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical literature.
B. Samples: 8 inch long samples of suspension system components, including main runner, cross tees and angle molding.
C. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards.

1.5 QUALITY ASSURANCE

A. Single-Source Responsibility: To ensure proper interface, all drywall furring components shall be produced or supplied by a single manufacturer.
B. All accessory components from other manufacturers shall conform to ASTM standards.
C. Fire Resistance Ratings: As indicated by reference to design designations in UL Fire Resistance Directory, for types of assemblies in which drywall ceilings function as a fire protective membrane and tested per ASTM E 119. Installation in accordance with the UL Design being referenced.
D. Coordination of Work:
    1. Coordinate drywall furring work with installers of related work including, but not limited to acoustical ceilings, building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.
    2. All work above the ceiling line should be completed prior to installing the drywall sheet goods. There should be no materials resting against or wrapped around the suspension system, hanger wires or ties.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

1.7 WARRANTY

A. Suspensions System: Submit a written limited warranty executed by the manufacturer, agreeing to repair or replace grid components that are supplied with a hot-dipped galvanized coating or aluminum base material. Failures include, but are not limited to:
The occurrence of 50% red rust as defined by ASTM D 610 test procedures as a result of defects in materials or factory workmanship.
B. Warranty Period:
Grid: Ten years from date of installation.
C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Suspension Systems: Armstrong World Industries, Inc.

2.2 SUSPENSION SYSTEMS

A. Components:
1. **FrameAll™** Main Beam: Shall be double-web with Peakform® bulb construction (minimum 0.0179 inch prior to protective coating, ASTM C645), hot dipped galvanized (Min G40 per ASTM A653).
    a. **HD8906**: 1-11/16 inch web height, 1-1/2 inch flange, available with G40 or G90 hot dipped galvanization.
    b. **HD8906HRC**: 1-11/16 inch web height, 1-1/2 inch flange, available with G40 hot dipped galvanization. (61% Recycle content, 53% Post Consumer, 8& Pre-Consumer).
    c. **HD8906IIC**: 1-11/16 inch web height, 1-1/2 inch flange, available with G40 hot dipped galvanization (to be used with IIC Sound Clip.
    d. **HD8906F08**: 1-11/16 inch web height with pre-cut facets (8 inches on center) for radius installations, 1-1/2 inch flange.
    e. **HD8906F16**: 1-11/16 inch web height with pre-cut facets (8 inches from ends, then 16 inches on center) for radius installations, 1-1/2 inch flange.
2. **FrameAll™** Cross Tees: Shall be double-web with Peakform® bulb, steel construction (minimum 0.0179 inch prior to protective coating, ASTM C645), hot dipped galvanized (minimum G40 per ASTM A653)
    a. **XL8945P**: 48 inch, web height 1-1/2 inch, knurled ridges, and pre-finished 1-1/2 inch knurled flange, available with G40 or G90 hot dipped galvanization
    b. **XL8945PHRC**: 48 inch, web height 1-1/2 inch, knurled ridges, and pre-finished 1-1/2 inch knurled flange. (61% Recycle content, 53% Post Consumer, 8& Pre-Consumer).
    c. **XL8965**: 72 inch, web height 1-1/2 inch, knurled ridges, and pre-finished 1-1/2 inch knurled flange, available with G40 or G90 hot dipped galvanization

d. **XL8965HRC**: 72 inch, web height 1-1/2 inch, knurled ridges, and pre-finished 1-1/2 inch knurled flange. (61% Recycle content, 53% Post Consumer, 8& Pre-Consumer).
e. **XL8947**: 50 inch, web height 1-1/2 inch, knurled ridges, and pre-finished 1-1/2 inch knurled flange, available with G40 or G90 hot dipped galvanization
f. **XL8940**: 40 inch, web height 1-1/2 inch, knurled ridges, and pre-finished 1-1/2 inch knurled flange.
g. **XL7936G90**: 36 inch web height 1-1/2 inch with rectangular bulb and pre-finished 1-1/2 inch knurled flange.

3. **SimpleSoffit™** FRAMING: Shall be double web steel construction (minimum 0.0179 inch prior to protective coating, ASTM C645), Main Beams designed for creating soffits; 1-1/4 inch web height. 1-1/2 inch flange, flattened top bulb. Mains 4 ft. O.C.
   a. **SSLU2424:** L Soffit Upturn 24 inch x 24 inch.
   b. **SSLU4824:** L Soffit Upturn 48 inch x 24 inch.
   c. **SSLU3636:** L Soffit Upturn 36 inch x 36 inch
   d. **SSLD2424:** L Soffit Downturn 24 inch x 24 inch.
   e. **SSLU1836:** L Soffit Upturn 18 inch. x 36 inch.
   f. **SSLU1872:** L Soffit Upturn 18 inch. x 72 inch.
   g. **SSU182418:** U Soffit 18 inch. x 24 inch. x 18inch.
   h. **SSU123612:** U Soffit 12 inch. X 36 inch. X 12 inch.
   i. **FZxxx:** Custom Option, Any 90 bend, min 24” long to max 144” long steel section.
4. **FrameAll™** Wall Molding: Shall include a knurled pattern surface, screw stop hem, pre-punched holes in top flange 4” o.c.
   a. **LAM12**: 12 foot Locking Angle Molding, 1-1/4 inch x 1-1/4 inch with pre-engineered locking tabs punched 8 inches on center, 018 mil. 25g.
   b. **LAM151220E**: 12 foot Locking Angle Molding, 1-1/2 inch x 1-1/2 inch with enhanced pre-engineered locking tabs punched 8 inches on center, 028 mil. 22g.
   c. **LAM12HRC**: 12 foot Locking Angle Molding, 1-1/4 inch x 1-1/4 inch with pre-engineered locking tabs punched 8 inches on center, .018 mil. 25g. (61% Recycle content, 53% Post Consumer, 8& Pre-Consumer).
   d. **KAM12**: 12 foot Knurled Angle molding, 1-1/4 inch x 1-1/4 inch,.018 mil. 25g.
   e. **KAM10**: 10 foot Knurled Angle molding, 1-1/4 inch x 1-1/4 inch, 018 mil. 25g.
   f. **KAM1510:** 10 foot Knurled Angle molding, 1-1/2 inch x 1-1/2 inch, .018 mil. 25g
   g. **KAM1512:** 12 foot Knurled Angle molding, 1-1/2 inch x 1-1/2 inch, .018 mil. 25g
   h. **KAM151020E:** 10 foot Knurled Angle molding, 1-1/2 inch x 1-1/2 inch,.028 mil. 22g
   i. **KAM151220E:** 12 foot Knurled Angle molding, 1-1/2 inch x 1-1/2 inch,.028 mil. 22g
   j. **KAM151020:** 10 foot Knurled Angle molding, 1-1/2 inch x 1-1/2 inch,.033 mil. 20g
   k. **KAM21025**: 10 foot Knurled Angle molding, 2 inch x 2 inch, .018 mil. 25g.
   l. **KAM21020**: 10 foot Knurled Angle molding, 2 inch x 2 inch, .033 mil. 20g.
   m. **KAM21020EQ**: 10 foot Knurled Angle molding, 2 inch x 2 inch, .028 mil. 22g.
   n. **KAM12G90**: 12 foot Knurled Angle molding, 1-1/4 inch x 1-1/4 inch, .018 mil. 25g. G90 hot dipped galvanized.
   o. **KAM1525G90:** 10 foot Knurled Angle molding, 1-1/2 inch x 1-1/2 inch, .018 mil. 25g, G90 hot dipped galvanized.
   p. **KAM1520G90:** 10 foot Knurled Angle molding, 1-1/2 inch x 1-1/2 inch, .033 mil. 20g, G90 hot dipped galvanized.
   q. **KAM21020G90**: 10 foot Knurled Angle molding, 2 inch x 2 inch, .028 mil. 22g. G90 hot dipped galvanized.
5. **SimpleCurve™** Wall Molding [Include if Armstrong SimpleCurve™ Moldings are used, otherwise delete]

   Curved Applications

a. **SC151220EQ:** 12 foot Simple Curve Knurled Angle Molding, 1-1/2 inch x 1-1/2 inch, knurled face radius 37 inch, screw stop hem, pre-punched holes in top flange, 4" O.C., 28 mil. (22ga.)
b. **SC151225:** 12 foot Simple Curve Knurled Angle Molding, 1-1/2 inch x 1-1/2 inch, knurled face radius 32 inch, screw stop hem, pre-punched holes in top flange, 4" O.C., 18 mil. (25ga.)
c. **SC21220EQ:** 12 foot Simple Curve Knurled Angle Molding,2 inch x 2 inch, knurled face radius 55 inch, screw stop hem, pre-punched holes in top flange, 4" O.C., 28 mil. (22ga.)
d. **SC21225:** 12 foot Simple Curve Knurled Angle Molding, 2 inch x 2 inch, knurled face radius 40 inch, screw stop hem, pre-punched holes in top flange, 4" O.C., 18 mil. (25ga.)

6. Fr**ameAll™** Transition Molding: Drywall to Acoustical ceiling. Hot Dipped Cold Rolled Steel, Pre-Painted Armstrong Global White, integral acoustical flange with an integrated drywall taping flange. [Include if Armstrong Transitions Moldings are used, otherwise delete]
   a. **7901**: 120 inch with 3/8 inch reveal and 9/16 inch acoustical flange.
   b. **7902**: 120 inch with 3/8 inch reveal and 15/16 inch acoustical flange.
   c. **7903**: 120 inch with 1 inch acoustical flange.
   d. **7904**: 120 inch with 15/16" flush horizontal flange.
   e. **7904PF**: 120 inch with 15/16" flush horizontal flange. (With Protective Film)
   f. **7905**: 120 inch with 9/16" flush horizontal flange.
   g. **7905PF**: 120 inch with 9/16" flush horizontal flange. (With Protective Film)
   h. **7906**: 120 inch "F" Flush vertical transition
   i. **7907**: 120 inch with 9/16" tegular horizontal flange.
   j. **7908**: 120 inch with 15/16" tegular horizontal flange.
   k. **7909**: 120 inch with 1 inch Step 15/16" horizontal flange.
   l. **7910**: 120 inch with 1 inch Step 9/16" horizontal flange.
   m. **7911**: 120 inch with 3/8 inch reveal and 9/16 inch acoustical flange.
   n. **7912**: 120 inch with 3/8 inch reveal and 15/16 inch acoustical flange.
   o. **7913**: 120 inch "F" with 3/8 inch reveal and 9/16 inch acoustical flange.
   p. **7914**: 120 inch "F" with 3/8 inch reveal and 15/16 inch acoustical flange.
7. **Axiom™** Cloud Trim: Axiom aluminum extrusion vertical upturn trim with integral drywall taping flange. Pre-Painted Armstrong Global White [Include if Armstrong Axiom Drywall Cloud Trims are used, otherwise delete
   a. **AX1PC2STR**: 120 inch x 2.5 inch, straight
   b. **AX1PC2CUR**: 120 inch x 2.5 inch, curved
   c. **AX1PC4STR**: 120 inch x 4 inch, straight
   d. **AX1PC4CUR**: 120 inch x 4 inch, curved
   e. **AX1PC6STR**: 120 inch x 6 inch, straight
   f. **AX1PC6CUR**: 120 inch x 6 inch, curved
   g. **AXBTSTR**: 120" Straight Bottom Trim for Drywall, used with Standard Axiom Classic Trim
   h. **AXBTCUR**: 120" Curved Bottom Trim for Drywall, used with Standard Axiom Classic Trim
8. **FrameAll™** Clips and Accessories:
   a. **MBAC**: Main Beam Adapter Clip
   b. **IIC**: Sound Isolation Clip (for use with HD8906IIC Main Runner)
   c. **DWACS, DW50, DW58**: Drywall Attachment Clip for transitions to acoustical ceilings
   d. **DW58LT**: Transition Clip for 5/8" drywall with Locking Tabs.
   e. **DW50LT**: Transition Clip for 5/8" drywall with Locking Tabs.
   f. **MBSC2**: Main Beam Spacer Clip.
   g. **GSC9**: Adjustable Grid Spacer Clip, 9 inch.
   h. **GSC12**: Adjustable Grid Spacer Clip, 12 inch.
   i. **GSC14**: Adjustable Grid Spacer Clip, 14 inch.

j. **DW30C**: 30 degree, Drywall Angle Clip
k. **DW45C**: 45 degree, Drywall Angle Clip
l. **DW60C**: 60 degree, Drywall Angle Clip
m. **DW90C**: 90 degree, Drywall Angle Clip
n. **XTAC**: Cross Tee Adapter Clip.
o. **DDC**: Double Drywall Clip.
p. **DLCC**: Direct Load Ceiling Clip.
q. **DWC**: Drywall Clip.
r. **RC2**: Radius Clip required to cover all pre-cut facets, including those not being clipped.
s. **QSUTC**: Uptight Clip.

9. **FrameAll™** Drywall LED Linear Light Trim Kits (XAL Compatible) [Include if XAL Lights are used, otherwise delete]
   a. **DGSLLTK24:** 2’ Linear Light Trim Kit for XAL 24” x 4” LED fixture
   b. **DGSLLTK30:** 30” Linear Light Trim Kit for XAL 30”x 4” LED fixture
   c. **DGSLLTK48:** 4’ Linear Light Trim Kit for XAL 48” x 4” LED fixture
   d. **DGSLLTK60:** 5’ Linear Light Trim Kit for XAL 60” x 4” LED fixture
   e. **DGSLLTK72:** 6’ Linear Light Trim Kit for XAL 72” x 4” LED fixture
   f. **DGSLLTK90:** 7’-6” Linear Light Trim Kit for XAL 90” x 4” LED fixture
   g. **DGSLLTK96:** 8’ Linear Light Trim Kit for XAL 96” x 4” LED fixture
   h. **DGSLLTK120:** 10’ Linear Light Trim Kit for XAL 120” x 4” LED fixture
   i. **DGSLLTKCON:** Continuous Linear Light Trim Kit for XAL 10’ x 4” LED fixture
10. Support Hanger [Include if Armstrong Hangers are used, otherwise delete]
   a. **SB12P**: Strong Back Support Hanger
   b. **CBS4:** 4 inch channel beam splice used to suspend main beams to 1-1/2” black iron carrying channels
   c. **CBS6:** 6 inch channel beam splice used to suspend main beams to 1-1/2” black iron carrying channels
   d. **CBS8:** 8 inch channel beam splice used to suspend main beams to 1-1/2” black iron carrying channels
   e. **CBS10:** 10 inch channel beam splice used to suspend main beams to 1-1/2” black iron carrying channels
   f. **CBS12:** 12 inch channel beam splice used to suspend main beams to 1-1/2” black iron carrying channels
   g. **CBS4SS:** 4 inch channel beam splice used to suspend SimpleSoffit® main beams to 1-1/2” black iron carrying channels
   h. **CBS6SS:** 6 inch channel beam splice used to suspend SimpleSoffit® main beams to 1-1/2” black iron carrying channels
   i. **CBS8SS:** 8 inch channel beam splice used to suspend SimpleSoffit® main beams to 1-1/2” black iron carrying channels
   j. **CBS10SS:** 10 inch channel beam splice used to suspend SimpleSoffit® main beams to 1-1/2” black iron carrying channels
   k. **CBS12SS:** 12 inch channel beam splice used to suspend SimpleSoffit® main
   l.
11. Screws for wallboard application shall be bugle head screws in accordance with thickness of material used.

12. Corner bead: Minimum #26 gauge, zinc alloy or plastic square edge type with expanded flanges.
   a. Casing bead: Minimum #24 gauge, zinc alloy or plastic square edge type with expanded flanges.
   b. Control Joints: Minimum #26 gauge, roll-formed zinc alloy, extruded aluminum or plastic with expanded flanges.
   c. Special Trim Shapes: As detailed on plans, extruded aluminum with acrylic coating by Fry Reglet or approved equal.

d. Metal Lath: 3.4 lbs/square yard, galvanized 3/8 inch diamond mesh or flat rib lath; security lath for applications requiring high degree of security.

B. Structural Classification:

1. Main Beam shall be heavy duty per ASTM C 635.
2. Classification can require wires to be closer together for additional loading when used to support double layer gypsum, verticals, slopes, domes, half barrels, circles, soffits, canopies, and step conditions which call for loading or unusual designs and shapes in drywall construction. Using cross tees in the construction of circles, barrels, etc. is common in order to hold the radius.
3. Deflection of fastening suspension system supporting light fixtures, ceiling grilles, access doors, verticals and horizontal loads shall have a maximum deflection of 1/360 of the span.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

A. Install suspension system and panels in accordance with the manufacturer's instructions, in compliance with ASTM installation standard, and with applicable codes as required by the authorities having jurisdiction.
B. The **FrameAll™** Drywall Grid System can be installed in interior or exterior applications.
C. To secure to metal clips, concrete inserts, steel bar joist or steel deck, use power actuated fastener, or insert. Coordinate placement for hanger wire spaced as required for expected ceiling loads and layout.
D. Install hanger wire as required with necessary on center spacing to support expected ceiling load requirements, following local practices, codes and regulations. Provide additional wires at light fixtures, grilles, and access doors where necessary. A pigtail knot shall be used with three tight wraps at top and bottom fastening locations.
E. Add additional wire as needed when using compatible clips and accessories.
F. Control Joints: Roll formed zinc alloy, aluminum, or plastic as required for expansion and contraction as shown on drawings.
G. Expansion Joints: Roll formed zinc alloy, aluminum, or plastic as required for expansion and contraction as shown on drawings.
H. Main beams shall be suspended from the overhead construction with hanger wire, spaced as required for expected ceiling loads, along the length of the main beams.
I. Install cross tees at on center spacing as specified by the drywall manufacturer. Typical drywall cross tee spacing:
    1. 16 inches on center with 5/8 or 1/2 inch gypsum board
    2. 24 inches on center with 5/8 inch gypsum board
J. Other items such as wood, sheet metal, or plastic panels should be screwed to comply with deflection limit equivalent to that of the ceiling installation.
K. Use channel molding or angle molding to interface with Drywall Grid System to provide perimeter attachment or to obtain drop soffits, verticals, slopes, etc.
L. To suspend a second ceiling beneath a new or existing drywall ceiling, without breaching the integrity of the upper ceiling, use the Drywall Clip. To form a transition from a drywall ceiling to an acoustical ceiling, use the Drywall Transition Clips spaced as required for expected loads.
M. For light fixtures (Type G, Type F) use secondary framing cross tees as required to frame opening.
N. Single cross tees in a route hole to be secured by 7/16 inch framing screw or alternative methods.

3.2 INSTALLATION - EXTERIOR APPLICATIONS

A. Use G90 components for exterior applications.
B. Use vertical bracing as required by codes and standards in accordance with local jurisdiction (non-fire rated installations).
C. Install main beams as required according to Wind Uplift Design or local codes and standards.
D. Install cross tees as required according to Wind Uplift Design or local codes and standards, with additional tees when point loading (vertical), and with additional hanger at midspan of cross tee, as needed.

3.3 INSTALLATION - INTERIOR APPLICATIONS

A. Install main beams and cross tees at the on center spacing required for ceiling loading, and location of in-ceiling services.
B. Additional bracing as required by code.

3.4 INSTALLATION - RADIUS APPLICATIONS

A. Determine the bow or camber (Convex or Concave) in a main runner.
B. Establish a jig or pattern on a flat surface; mark locations to cut main beam; and use four pan head screws to fasten a Radius Clip (RC2) flat to the web between the bulb and the flange, per the manufacturer's instructions.
C. Install main beams with on center spacing and wire spacing, as needed, to support expected ceiling load.
D. Additional bracing may be required by code.
E. Install cross tees at on center spacing as specified by the manufacturer.

END OF SECTION

SECTION 09 30 00
TILING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Interior porcelain tile.
2. Setting system.

1.02 SUBMITTALS

A. Product Data: Manufacturer's specifications and technical data including performance, construction and fabrication.

B. Samples: Submit three (3) sets of samples for color selection and verification for the following.

1. Each tile type of size, color and finish indicated.
2. Grout colors.
3. Sealant colors.
4. Operating and Maintenance Manual, including recommendations for cleaning and maintenance for each type of tile.
5. Extra Materials for Owners Stock.

1.03 QUALITY ASSURANCE

A. Installer's Qualifications: Firm with not less than 5 years experiences in installation of systems similar in complexity to those required for this Project, including specific requirements indicated.

1. Successfully completed not less than 5 comparable scale projects using this system.

1.04 DELIVERY, STORAGE, AND HANDLING

B. Packing and Shipping: Deliver products in original unopened packaging with legible manufacturer's identification.

C. Storage and Protection: Comply with manufacturer's recommendations.

1. Protect from the elements and from damage.
2. Store at a temperature of not less than 55 degrees F. for 24 hours before installation.

1.05 PROJECT CONDITIONS

A. Environmental Requirements: Maintain ambient temperature within range of 55 to 90 degrees F. during and at least 24 hours after installation of tile materials.

1. Provide adequate ventilation to carry off excess moisture.
2. Do not apply setting materials to surfaces containing frost.
3. Do not install tile in areas where temperature of substrate is above 100 degrees **F.**

1.06 MAINTENANCE

A. Extra Materials: Provide additional quantities, equal to 2 percent of the total square footage for each tile type installed. Round off quantities to the next higher full case. Provide the following special trim pieces:

PART 2 - PRODUCTS

2.01 CERAMIC TILES

A. Ceramic Tile (Glazed and/or poecelain): Refer to the “Finish And Material Legend” for types, colors, sizes, and manufacturers.

B. Trim Units: Provide tile trim units to match characteristics of adjoining flat tile and to comply with following requirements:

1. Size: Coordinated with sizes and coursing of adjoining flat tile where applicable.
2. Shapes: As follows, selected from manufacturer's standard shapes:

a. Base: Coved, and non-coved where indicated or scheduled. Provide base of same size as the field tile, unless otherwise indicated or scheduled.
b. External Corners: Surface bullnose.
c. Internal Corners: Field-butted square corners, except use coved base and cap angle pieces designed to member with stretcher shapes.

2.02 TILE ACCESSORIES

A. Metal Transition Member: Provide stainless steel angle transition members, and "Jolly" extruded aluminum trim at tile by Schluter.

2.03 SETTING MATERIALS

A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.

1. Water emulsion acrylic latex additive: Add at Project site to prepackaged dry mortar mix recommended by latex manufacturer. Setting bed used in conjunction with glass tile shall be white.

2.04 GROUTING MATERIALS

A. Floor Grout: Latex-portland cement sanded floor grout consisting of a blended mixture of portland cement, color-fast pigments, and high strength aggregates complying with ANSI A118.6, complete with second generation latex additive.

1. Grout colors: As indicated.

2.05 ACCESSORIES

A. Sealant: Polyurethane based, 2-part elastomeric sealant, complying with FS TT-S-00227, Class A, Type 1 (self-leveling) unless Type 2 (non-sag) recommended by manufacturer for the application shown.

1. Color: As selected by the Architect.

B. Joint Primer, Bond Breaker Tape and Backer Rod (for use with sealant): As recommended by the sealant manufacturer for use with his product and substrate to which it is to be applied

C. Crack Isolation Membrane: Manufacturer's standard product that complies with ANSI A118.12 for standard performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

D. Shower system: Schluter Systems Kerdi-Shower Kit: all-inclusive package containing each of the components required to create a watertight shower assembly.

2.06 MANUFACTURER

A. All setting materials, grouting materials, and accessories to be sourced from a single manufacturer

1. Mapei or approved equal.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper or timely completion.

1. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Preparation: Level walls or floors to receive tile using mortar bed or other material recommended by tile manufacture.

B. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:

1. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.

3.03 INSTALLATION

A. Lay out tile so sizes less than 1/2 size do not occur. Staggered joints are not permitted unless otherwise indicated.

B. Comply with TCA Standard Installation Specifications A108.1 through A108.10 and the TCA "Handbook for Ceramic Tile Installation", except as modified herein.

C. Set individual tiles larger than 8 inches by 8 inches into setting material, taking care to maintain accurate joint alignment and spacing. set tile to obtain 100 percent contact between back of tile and setting material. Scribe and cut tile as necessary around obstructions to produce closely fitted, neat joints of uniform width throughout the installation.

D. Align wall tile and base lines with floor tile grout lines.

3.04 SETTING METHODS

A. TCA Installation Guidelines: TCA "Handbook for Ceramic Tile Installation"; comply with TCA installation methods indicated..

B. Install ceramic tile to ,comply with requirements specified below for setting method, and installation method related to type of substrate construction and grout type.

C. Back Buttering: Obtain 100 percent mortar coverage on floors by complying with applicable special requirements for back buttering of tile in referenced ANSI A108 series of tile installation standards:

D. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions except as otherwise shown. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

E. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so that plates, collars, or covers overlap tile.

F. Jointing Pattern: Unless otherwise shown, lay tile in running bond pattern. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths unless otherwise shown.

G. Crack Control Membrane: Install over entire surface to receive ceramic and porcelain tile in accordance the manufacturer's instructions.

H. TCA F125A Floor Setting Method: Thin-set with latex-portland cement mortar over crack control membrane.

1. Setting method location: Where tile occurs on concrete floors where no depressions occur, and a crack control membrane is indicated.

I. TCA W243 Wall Setting Method at Gypsum Board: Thin-set with latex portland cement mortar over gypsum board and metal studs.

1. Setting method location: Where tile occurs on walls over gypsum board unless indicated otherwise.

3.05 GROUTING

A. Allow tile to set 48 hours before grouting.

B. Comply with TCA instructions and material manufacturer's recommendations for grouting.

C. Grout ceramic floor tile in accordance with manufacturer's instructions.

1. Add latex bonding additives in compliance with manufacturer's recommendations.
2. Wet or dampen tile and/or joints in compliance with tile manufacturer's recommendations.
3. Tool joints to hard dense surface, free of pin holes, cracks and voids.

D. Damp or wet cure grout installed on floors for not less than 72 hours.

3.06 EXPANSION JOINT INSTALLATION

A. Comply with TCA EJ171 for detailing and installation of expansion joints in tile Work, and for detailing, installation and spacing of control joints in tile Work.

1. Install removable divider strips of the same depths as the finished tile system, including setting bed. Remove strips after grouting and curing operations.
2. Remove excess compounds promptly as the work progresses. Clean the adjoining surfaces by whatever means may be necessary to eliminate evidence of excess, without damage to the adjoining surfaces or finishes.
3. Prepare joints and apply sealants to comply with requirements of referenced standards and sealant

3.07 CLEANING AND PROTECTION

A. Clean setting materials and grout from face of tile while materials are workable. Leave tile face clean of foreign matter.

B. Do not permit traffic or performance of other work in areas where tile is being installed.

C. Do not walk on or perform work on newly installed tile floors without using kneeling boards or equivalent protection.

D. Prohibit traffic on installed tile for not less than 72 hours after installation or until tile is firmly set.

END OF SECTION

SECTION 09 51 00

Acoustical Ceilings

SoundScapes® Shapes Acoustical Clouds – Colors

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general conditions of Contract, including General and Supplementary Conditions and Divisions-1 Specification sections apply to work of this section.

1.2 SUMMARY

A. Section Includes:
   1. Acoustical ceiling and wall panels
   2. Exposed grouping frame suspension systems
   3. Wire hangers, cables, fasteners, wall and ceiling hanging kit accessories

B. Related Sections:
   1. Section 09 50 00 – Ceilings
   2. Section 09 51 13 – Acoustical Panel Ceilings
   3. Section 09 53 00 – Acoustical Ceiling Suspension Assemblies
   4. Section 09 54 00 – Specialty Ceilings
   5. Section 09 54 33 – Decorative Panel Ceilings
   6. Section 09 54 53 – Fiberglass Reinforced Panel Ceilings

C. Alternates
   1. Prior Approval: Unless otherwise provided for in the Contract documents, proposed product substitutions may be submitted no later than TEN (10) working days prior to the date established for receipt of bids. Acceptability of a proposed substitution is contingent upon the Architect's review of the proposal for acceptability and approved products will be set forth by the Addenda. If included in a Bid are substitute products that have not been pre-approved by the architect and included in the Addenda, the originally specified products shall be provided without additional compensation.
   2. Submittals that do not provide adequate data for the product evaluation will not be considered. The proposed substitution must meet all requirements of this section, including but not necessarily limited to, the following: Single source materials suppliers; Underwriters' Laboratories Classified Acoustical performance; Panel design, size, composition, color, and finish; Suspension system component profiles and sizes; Compliance with the referenced standards.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
   2. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
   3. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
   4. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
6. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels
7. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
8. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials
9. ASTM E 580 Installation of Metal Suspension Systems in Areas Requiring Moderate Seismic Restraint
10. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems
11. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum
12. ASTM E 1264 Classification for Acoustical Ceiling Products

B. NFPA 286 Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth
C. ASHRAE Standard 62.1-2004, “Ventilation for Acceptable Indoor Air Quality”
D. ICC ESR 1308 International Code Council Evaluation Report Independent Evaluation of Armstrong Suspension Components for Seismic Installations
E. International Building Code
F. ASCE 7 American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures
G. International Code Council-Evaluation Services - AC 156 Acceptance Criteria for Seismic Qualification Testing of Non-structural Components
H. LEED - Leadership in Energy and Environmental Design is a set of rating systems for the design, construction, operation, and maintenance of green buildings

1.4 SYSTEM DESCRIPTION

A. Discontinuous

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.
B. Samples: Minimum 6” x 6” submittal sample of specified panel color.
C. Shop Drawings: Layout and details of acoustical ceilings show locations of items, which are to be coordinated with, or supported by the ceilings.
D. Acoustical Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification, such as Underwriter’s Laboratory (UL) of NRC.
    A. If the material supplied by the acoustical subcontractor does not have an independent laboratory classification of acoustical performance on every carton, subcontractor shall be required to send material from every production run appearing on the job to an independent or NVLAP approved laboratory for testing, at the architect's or owner's

discretion. All products not conforming to manufacturer's current published values must be removed, disposed of, and replaced with complying product at the expense of the Contractor performing the work.

1.6 SUSTAINABLE MATERIALS

A. Transparency: Manufacturers will be given preference when they provide documentation to support sustainable requirements for the following: Material ingredient transparency, Removal of Red List Ingredients per LBCV3, Life Cycle impact information, Low-Emitting Materials, and Clean Air performance.
   1. End of Life Programs/Recycling: Where applicable, manufacturers that provide the option for recycling of their products into new products at end-of-life through take-back programs will be preferred.
   2. Products meeting LEED V4 requirements including:
      i. Storage & Collection of Recyclables
      ii. Construction and Demolition Waste Management Planning
      iii. Building Life-Cycle Impact Reduction
      iv. Building Product Disclosure and Optimization Environmental Product Declarations
      v. Building Product Disclosure and Optimization Sourcing of Raw Materials
      vi. Building Product Disclosure and Optimization Material Ingredients
      vii. Construction and Demolition Waste Management

1.7 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.
B. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
   1. Surface Burning Characteristics: Class A as follows, tested per ASTM E84 and CAN/ULC S102:
      a. Flame Spread: 25 or less
      b. Smoke Developed: 50 or less
C. Handle acoustical panels carefully to avoid scratching or denting units in any way.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.
C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.9 PROJECT CONDITIONS

A. Space Enclosure:

All ceiling products and suspension systems must be installed and maintained in accordance with Armstrong written installation instructions for that product in effect at the time of installation and best industry practice. Prior to installation, the ceiling product must be kept clean and dry, in an environment that is between 32°F (0°C) and 120°F (49°C) and not subject to Abnormal Conditions. Abnormal conditions include exposure to chemical fumes, vibrations, moisture from conditions such as building leaks or condensation, excessive humidity, or excessive dirt or dust buildup.

1.10 WARRANTY

A. Shapes: Submit a written warranty executed by the manufacturer, agreeing to repair or replace acoustical panels that fail within the warranty period. Failures include, but are not limited to:
    1. Shape Panels: Sagging and warping as a result of defects in materials or factory workmanship.
    2. Suspension System: Rusting and manufacturer's defects
B. Warranty Period:
    1. Shapes: One (1) year from date of substantial completion
    2. Suspension System: Ten (10) years from date of substantial completion
C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.11 MAINTENANCE

A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
    1. Acoustical Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.
    2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

Part 2 - PRODUCTS

2.1. MANUFACTURERS

1) Basis of Design SoundScapes Shapes
    a) Armstrong World Industries Inc.
2) Suspension System
    a) Armstrong World Industries Inc.

2.2.1 SoundScapes Shapes:

1. Surface Texture: Fine
2. Composition: Fiberglass
3. Color: Ocean (DOC)
    1. Shape Design:
    2. 5444F02G01 90° Hexagon
       Edge Profile: Square
4. Recycled Content: 51%
5. Acoustics: Sound absorption up to 1.00 Noise Reduction Coefficient (NRC) ASTM C 423
6. Flame Spread: ASTM E 1264; Class A (UL)
7. Dimensional Stability: BioBlock; Anti-Microbial, inherent

8. Basis of Design: SoundScapes Shapes, (item 5444F02G01DOC) as manufactured by Armstrong World Industries

    a. Item 625530 - Extended Hanging Aircraft Cables (30' length, 4 per bag). For use with Item 5450L8CR when longer cables are needed.
    b. Item 7121 – Angled Hanging Kit (2 per kit). 60º maximum angle.
    c. Item 7006 – Escutcheon Kit (2 per kit). Used when hanging panels below an existing ceiling.

2.2.4 Group Suspension Systems:

A. Group Suspension: Acceptable product as manufactured by Armstrong World Industries

    a. Item 5451_ _ - Grouping Frame Kit, **White** (4 per kit). 12’ suspension frames used to group panels together.

    b. Item 5452_ _ - Frame Splice Kit, White (2 per kit). Connects group suspension frames for longer runs (> 12 feet).

    c. Item 5453D060 – 60º Frame Alignment Kit (4 per kit). For use with group suspension frames.

    d. Item 5453D090 – 90º Frame Alignment Kit (4 per kit). For use with group suspension frames.

    e. Item 5454_ _ - Panel Hook Kit, White. For use with group frames (one kit per all panels except item 5449, Large Rectangle, which requires two kits).

    f. Item 5450L8CR – Deck Hanging Kit (2 per kit). Allows for suspending grouping frames from deck and bottom end adjustment of height at panel or frame level.

B. Accessories

    a. Item 5632 – Grid Hook Kit (4 per kit). For hanging individual panels from an Armstrong standard suspension system.
    b. Item 5629 – Multi-plane Hanging 1” Drop Hook Kit
    c. Item 5630 – Multi-plane Hanging 2” Drop Hook Kit
    d. Item 5631 – Multi-plane Hanging 3” Drop Hook Kit
    e.

C. Seismic Accessories Required

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations. (Exception: HumiGuard Max Ceilings)

3.2 PREPARATION

A. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.
    1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.3 INSTALLATION

A. Install SoundScapes Shapes per Armstrong World Industries installation instructions.

B. For areas having seismic requirements, consult with the Authority Having Jurisdiction or Building Code to determine the local requirements and following the manufacturers seismic guidelines found in the manufacturers Installation instructions.
C. Install suspension system per ASTM C636 unless otherwise noted in the manufactures Installation Instructions.

3.4 ADJUSTING AND CLEANING

A. Replace damaged and broken shapes.
B. Clean exposed surfaces of shapes and suspension members comply with manufacturer's instructions for cleaning and touch up of minor finish damage.
C. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09 51 13

ACOUSTICAL PANEL CEILINGS

SCHOOL ZONE FINE FISSURED

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

Drawings and general conditions of Contract, including General and Supplementary Conditions and Divisions-1 Specification sections apply to work of this section.

1.2 SUMMARY

A. Section Includes

1. Acoustical ceiling panels
2. Exposed grid suspension system
3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings
4. Perimeter Trim

B. Related Sections

1. Section 09 50 00 - Ceilings
2. Section 09 51 14 – Acoustical Fabric Faced Panel Ceilings
3. Section 09 51 23 – Acoustical Tile Ceilings
4. Section 09 53 00 - Acoustical Ceiling Suspension Assemblies
5. Section 09 20 00 - Plaster and Gypsum Board
6. Section 01 81 13 - Sustainable Design Requirements
7. Section 01 81 19 - Indoor Air Quality Requirements
8. Section 02 42 00 - Removal and Salvage of Construction Materials
9. Division 23 - HVAC Air Distribution
10. Division 26 - Electrical

C. ALTERNATES

1. Prior Approval: Unless otherwise provided for in the Contract documents, proposed product substitutions may be submitted no later than TEN (10) working days prior to the date established for receipt of bids. Acceptability of a proposed substitution is contingent upon the Architect's review of the proposal for acceptability and approved products will be set forth by the Addenda. If included in a Bid are substitute products that have not been

pre-approved by the architect and included in the Addenda, the originally specified products shall be provided without additional compensation.

2. Submittals that do not provide adequate data for the product evaluation will not be considered. The proposed substitution must meet all requirements of this section, including but not necessarily limited to, the following: Single source materials suppliers; Underwriters' Laboratories Classified Acoustical performance; Panel design, size, composition, color, and finish; Suspension system component profiles and sizes; Compliance with the referenced standards.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
   2. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
   3. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
   4. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
   5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
   6. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels
   7. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
   8. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials
   9. ASTM E 580 Installation of Metal Suspension Systems in Areas Requiring Moderate Seismic Restraint
   10. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems
   11. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum
   12. ASTM E 1264 Classification for Acoustical Ceiling Products
B. International Building Code
C. ASHRAE Standard 62.1-2004, Ventilation for Acceptable Indoor Air Quality
D. NFPA 70 National Electrical Code

E. ASCE 7 American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures
F. International Code Council-Evaluation Services - AC 156 Acceptance Criteria for Seismic Qualification Testing of Non-structural Components
G. International Code Council-Evaluation Services Report - Seismic Engineer Report
    1. ESR 1308 - Armstrong Suspension Systems
H. International Association of Plumbing and Mechanical Officials - Seismic Engineer Report
    1. 0244 - Armstrong Single Span Suspension System
I. California Department of Public Health CDPH/EHLB/Standard Method v1.2 2017
J. LEED - Leadership in Energy and Environmental Design is a set of rating systems for the design, construction, operation, and maintenance of green buildings
K. International Well Building Standard
L. Mindful Materials
M. Living Building Challenge
N. U.S. Department of Agriculture BioPreferred program (USDA BioPreferred).
O. Clean Rooms up to ISO Class 5 (Class 100)

1.4 SYSTEM DESCRIPTION

A. Continuous/Wall-to-wall

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.
B. Samples: Minimum 6-inch x 6-inch samples of specified acoustical panel; 8-inch-long samples of exposed wall molding and suspension system, including main runner and 4-foot cross tees.
C. Shop Drawings: Layout and details of acoustical ceilings show locations of items that are to be coordinated with or supported by the ceilings.
D. Acoustical Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification, such as Underwriter’s Laboratory (UL), of NRC, CAC, and AC.
    1. If the material supplied by the acoustical subcontractor does not have an independent laboratory classification of acoustical performance on every carton, subcontractor shall be required to send material from every production run appearing on the job to an independent or NVLAP approved laboratory for testing, at the architect's or owner's discretion. All products not conforming to manufacturer's current published values must

be removed, disposed of, and replaced with complying product at the expense of the Contractor performing the work.

1.6 SUSTAINABLE MATERIALS

A. Transparency: Manufacturers will be given preference when they provide documentation to support sustainable requirements for the following: Material ingredient transparency, Removal of Red List Ingredients per LBCV3, Life Cycle impact information, Low-Emitting Materials, and Clean Air performance.

1. Health Product Declaration (HPD). The end use product has a published, complete Health Product Declaration with disclosure at a minimum of 1000ppm of known hazards in compliance with the Health Product Declaration Open Standard.
2. Declare Label. The end use product has a published Declare label by the International Living Future Institute with disclosure of 100 ppm with a designation of Red List Free or Compliant (less than 1% proprietary ingredients).
3. Low Emitting products with VOC emissions data. Preference will be given to manufacturers that can provide emissions data showing their products meet any of the following: CDPH/EHLB/Standard Method v1.2-2017; Indoor Air Quality Certified to SCS-105 v4.2-2023
4. Life cycle analysis. Products that have communicated lifecycle data through Environmental Product Declarations (EPDs) will be preferred.
5. Biobased products derived from plants and other renewable materials will be given preference. Provide USDA Certified Biobased Product certification.
6. End of Life Programs/Recycling: Where applicable, manufacturers that provide the option for recycling of their products into new products at end-of-life through take-back programs will be preferred.
7. Products meeting LEED V4 requirements including:
    i. Storage & Collection of Recyclables
    ii. Construction and Demolition Waste Management Planning
    iii. Building Life-Cycle Impact Reduction
    iv. Building Product Disclosure and Optimization Environmental Product Declarations
    v. Building Product Disclosure and Optimization Sourcing of Raw Materials
    vi. Building Product Disclosure and Optimization Material Ingredients
    vii. Construction and Demolition Waste Management

1.7 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer to ensure fit and function.
B. Installer Qualifications: Company specializing in performing specified work type, a minimum of three years of documented experience, and approved by the manufacturer.
C. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
D. Surface Burning Characteristics: Tested per ASTM E 84 and complying with ASTM E 1264 Classification.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.
C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

1.9 PROJECT CONDITIONS

A. Space Enclosure:
    1. HumiGuard Plus Ceilings: Building areas to receive ceilings shall be free of construction dust and debris. Products with HumiGuard Plus performance and hot dipped galvanized steel, aluminum or stainless-steel suspension systems can be installed up to 120°F (49°C) and in spaces before the building is enclosed, where HVAC systems are cycled or not operating. Cannot be used in exterior applications where standing water is present or where moisture will come in direct contact with the ceiling.

1.10 ALTERNATE CONSTRUCTION WASTE DISPOSAL

A. Ceiling material being reclaimed must be kept dry and free from debris.
B. Before disposing of ceilings, contact the Armstrong Recycling Center at 877-276-7876, select option #1 then #8 to review with a consultant the condition and location of building where the ceilings will be removed. The consultant will verify the condition of the material and that it meets the Armstrong requirements for recycling. The Armstrong consultant will help facilitate the process to recycle the ceiling.
C. Recycling may qualify for LEED Credits:
    1. LEED 2009 - Category 4: Material and Resources (MR)
        i. Credit MRc2: Construction Waste Management
    2. LEEDv4 - MRp2

i. Construction Waste Management Planning Qualifies as a material stream (non-structural) targeted for diversion. Ceilings will be source-separated and diverted through the Armstrong Ceiling Recycling Program.

3. LEEDv4-MRc5
    i. Option 1: Divert ceilings to qualify for one of the 3 material streams (50%)
    ii. Option 2: Divert ceilings to qualify for one of the 4 material streams (75%)

1.11 WARRANTY

A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to the following:
    1. Acoustical Panels with HumiGuard® Max and HumiGuard® Plus performance: sagging and warping
    2. Acoustical panels with BioBlock® performance: growth of mold and mildew
    3. Grid System: rusting and manufacturer's defects
B. Warranty Period:
    1. Ceiling System: Thirty (30) years from date of substantial completion
C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.12 MAINTENANCE

A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
    1. Acoustical Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.
    2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Ceiling Panels:
    1. Armstrong World Industries, Inc.
B. Suspension Systems:
    1. Armstrong World Industries, Inc.

2.2 ACOUSTICAL CEILING UNITS

A. Acoustical Panel Ceilings
    1. Surface Texture: Medium Texture
    2. Composition: Mineral Fiber
    3. Color: White
    4. Size: 24 in x 24 in
    5. Edge Profile: Square Lay-in
    6. Noise Reduction Coefficient (NRC) ASTM C 423 Classified w/ UL label on product carton: 0.70
    7. Ceiling Attenuation Class (CAC): ASTM E1414/E1414M; Classified with UL label on product carton: 35
    8. Flame Spread: ASTM E 1264; Class A
    9. Light Reflectance (LR) White Panel: ASTM E 1477; 0.82
    10. Dimensional Stability: HumiGuard Plus
    11. Recycle Content: Up to 56% total recycled content. (Total recycled content: pre-consumer, post-consumer and post-industrial)
    12. Material Ingredient Transparency: Health Product Declaration (HPD); Declare Label
    13. Life Cycle Assessment: Third Party Certified Environmental Product Declaration (EPD)
    14. Indoor Air Quality Certified to SCS-105 v4.2-2023
    15. USDA Certified Biobased Product
    16. Basis of Design: **SCHOOL ZONE FINE FISSURED, item number 1713 ,** as manufactured by Armstrong World Industries, Inc.
    17. Substitutions: Refer to Alternates in Part 1.

2.3 METAL SUSPENSION SYSTEMS

A. Components: Main beams and cross tees, base metal and end detail, fabricated from commercial quality hot dipped galvanized steel complying with ASTM A 653. Main beams and cross tees are double-web steel construction exposed flange design. Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.

1. Structural Classification: ASTM C 635 Heavy Duty.
2. Color: White or match the actual color of the selected ceiling tile, unless noted otherwise.
3. Sustainability: Environmental Product Declaration (EPD), Health Product Declaration (HPD)
4. Basis of Design:
    i. Prelude XL 15/16” Exposed Tee as manufactured by Armstrong World Industries, Inc.
5. Substitutions: Refer to Alternates in Part 1.

B. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
C. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft annealed, with a yield stress load of at least time three design load, but not less than 12 gauge.
D. Edge Moldings as manufactured by Armstrong World Industries, Inc.
E. AXIOM Trim & Transitions as manufactured by Armstrong World Industries, Inc. www.armstrongceilings.com/axiom
F. Accessories as manufactured by Armstrong World Industries, Inc.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations. (Exception: HumiGuard Max Ceilings)

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.
B. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.
    1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.3 INSTALLATION

A. Follow manufacturer installation instructions.
B. Install suspension system and panels in accordance with the manufacturer's instructions, and in compliance with ASTM C 636 and with the authorities having jurisdiction.
C. Suspend main beam from overhead construction with hanger wires spaced 4 feet on center along the length of the main runner. Install hanger wires plumb and straight.
D. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.
E. For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.
F. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

3.4 ADJUSTING AND CLEANING

A. Replace damaged and broken panels.
B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove any ceiling products that cannot be successfully cleaned and or repaired. Replace with attic stock or new product to eliminate evidence of damage.

SECTION 09 54 00

09 54 00 Integrated Ceiling Assemblies

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

Drawings and general conditions of Contract, including General and Supplementary Conditions and Divisions-1 Specification sections apply to work of this section.

1.2 SUMMARY

a) Section Includes

1) Acoustical ceiling panel
2) Wire hangers, fasteners, main runners, cross tees, and wall angle moldings
3) Perimeter Trim

b) Related Sections

1) Section 09 51 13 - Acoustical Fabric-Faced Panel Ceilings
2) Section 09 53 00 - Acoustical Ceiling Suspension Assemblies
3) Section 09 83 00 – Acoustical Finish
4) Section 09 20 00 - Plaster and Gypsum Board
5) Section 09 22 16 - Non-Structural Metal Framing
6) Section 01 81 13 - Sustainable Design Requirements
7) Section 01 81 19 - Indoor Air Quality Requirements
8) Section 02 42 00 - Removal and Salvage of Construction Materials
9) Divisions 23 - HVAC Air Distribution
10) Division 26 - Electrical

c) Alternates

1) Prior Approval: Unless otherwise provided for in the Contract documents, submit proposed product substitutions no later than TEN (10) working days prior to the date established for receipt of bids. Acceptability of a proposed substitution is contingent upon the Architect’s review and acceptance. Approved products will be set forth by the Addenda. If a substitution is included in a Bid and is not approved by an Addendum, the specified products shall be provided as in place of the substitute without additional compensation.

2) Submittals that do not provide adequate data for the product evaluation will not be considered. The proposed substitution must meet all requirements of this section, including but not necessarily limited to, the following: Single source materials suppliers (if specified in Section 1.5); Underwriters' Laboratories Classified Acoustical performance; Panel design, size, composition, color, and finish; Suspension system component profiles and sizes; Compliance with the referenced standards.

1.3 REFERENCES

a) American Society for Testing and Materials (ASTM):

1) ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability

2) ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire

3) ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process

4) ASTM C 645 Standard Specification for Metal Suspension Systems

5) ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels

6) ASTM C754 AND C1858 All installations should be in compliance with these tests.

7) ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber

8) ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials

9) ASTM E 580 Installation of Metal Suspension Systems in Areas Requiring Moderate Seismic Restraint

10) ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

11) ASTM E 1414 Standard Test Method for Airborne Sound Attenuation between Rooms Sharing a Common Ceiling Plenum

12) ASTM E 1264 Classification for Acoustical Ceiling Products

13) ASTM E3090 All references to suspension component property testing per this test method.

b) B. International Building Code

c) C. ASHRAE Standard 62.1-2004, Ventilation for Acceptable Indoor Air Quality

d) D. NFPA 70 National Electrical Code

e) E. ASCE 7 American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures

f) International Code Council-Evaluation Services - AC 156 Acceptance Criteria for Seismic Qualification Testing of Non-structural Components

g) International Code Council-Evaluation Services Report - Seismic Engineer Report

a. 1. ESR 1289 - Armstrong Suspension Systems

h) California Department of Public Health CDPH/EHLB Emission Standard Method Version 1.2 2017

i) LEED - Leadership in Energy and Environmental Design is a set of rating systems for the design, construction, operation, and maintenance of green buildings

j) International Well Building Standard

k) Mindful Materials

l) Living Building Challenge

1.4 SYSTEM DESCRIPTION

Continuous/Wall-to-Wall or Cloud installation

1.5 SUBMITTALS

a) **Shop Drawings:** Layout and details of ceilings. Show locations of items that are to be coordinated with, or supported by the ceilings.

b) **Installation Instructions:** Submit manufacturer's installation instructions as referenced in Part three, Installation.

c) **Product Data:** Submit manufacturer's technical data for each type of ceiling unit and suspension system required.

d) **Samples:** Minimum 6 x 6 inch samples of specified panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees.

e) **Certifications:** Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards.

f) **Non-Conformance:** All products not conforming to the requirements of this specification and or the manufacturer's published values are to be disposed. The Contractor performing the work will replace with approved product at their expense.

1.6 SUSTAINABLE MATERIALS

a) Transparency: Manufacturers will be given preference when they provide documentation to support sustainable requirements for the following: Material ingredient transparency, Removal of Red List Ingredients per LBCV3, Life Cycle impact information, Low-Emitting Materials, and Clean Air performance.

1)Health Product Declaration. The end use product has a published, complete Health Product Declaration with disclosure at a minimum of 1000ppm of known hazards in compliance with the Health Product Declaration open Standard.

2)Declare Label. The end use product has a published Declare label by the International Living Future Institute with disclosure of 100 ppm with a designation of Red List Free or Compliant (less than 1% proprietary ingredients).

3)Low Emitting products with VOC emissions data. Preference will also be given to manufacturers that can provide emissions data showing their products meet CDPH Standard Method v1.2, 2017 (Section 01350).

4)Life cycle analysis. Products that have communicated lifecycle data through Environmental Product Declarations (EPDs) will be preferred.

5)End of Life Programs/Recycling: Where applicable, manufacturers that provide the option for recycling of their products into new products at end-of-life through take-back programs will be preferred.

6)Products meeting LEED V4 requirements including:

a. Storage & Collection of Recyclables
b. Construction and Demolition Waste Management Planning
c. Building Life-Cycle Impact Reduction
d. Building Product Disclosure and Optimization Environmental Product Declarations
e. Building Product Disclosure and Optimization Sourcing of Raw Materials
f. Building Product Disclosure and Optimization Material Ingredients
g. Construction and Demolition Waste Management

1.7 QUALITY ASSURANCE

a) Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.

b) Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.

c) Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 Classification.

d) Acoustical Panels: As with other architectural features located at the ceiling that may obstruct or skew the planned fire sprinkler pattern through possibly delay or accelerate the activation of the sprinkler or fire detection systems by channeling heat from a fire either toward or away from the device. Designers and installers are advised to consult a fire protection engineer, NFPA 13, or their local codes for guidance where automatic fire detection and suppression systems are present.

e) Coordination of Work: Coordinate acoustical ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers. ACOUSTIBuilt Panels are 7/8” thick.

f) Installer Qualification: Subcontractor is an experienced Installer that has reviewed and understands the system installation instructions thoroughly. Subcontractor will follow written installation instructions and utilize approved equipment and procedures for finishing installation.

g) ACOUSTIBuilt is finished to a level 4 drywall finish equivalent. Installing ACOUSTIBuilt requires special attention to finishing details. Light coves and low angle lighting will exaggerate imperfections. Mock-ups and hands-on training are strongly recommended.

1.8 DELIVERY, STORAGE AND HANDLING

a) Deliver acoustical ceiling units to project site in original, unopened packages/crates and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

b) Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content. Store all material within temperature limits required by manufacturer.

c) Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.9 PROJECT CONDITIONS

a) Space Enclosure:

1) Building areas to receive ceilings shall be free of construction dust and debris. ACOUSTIBuilt panels should be installed in areas where the building is enclosed and the HVAC is continuously functioning. This product is not recommended for exterior applications, where standing water is present, or where moisture will come into direct contact with the ceiling.
    i. HVAC should be designed, installed, and operated in accordance with ASHRAE Standard 62.1. It is also necessary for the area to be enclosed, for the HVAC systems to be functioning, and in continuous operations for the life of the product. Product is not intended for use where natural ventilation is part of the ventilation strategy and not recommended in areas where a differential plenum pressure exists.

1.10 WARRANTY

a) Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to the following:
    a. Acoustical Panels: Manufacturer’s defects in material
    b. Grid System: Rusting and manufacturer's defects
b) Warranty Period:
    a. Acoustical panels: Ten (10) years from date of substantial completion
    b. Suspension: Ten (10) years from date of substantial completion
c) The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

I. PART 2 - PRODUCTS

2.1 MANUFACTURERS

a) Basis of Design ACOUSTIBuilt:
    a. Armstrong World Industries, Inc.
b) Finish
    a. Joint Compound Finish by Others
    b. Spray Applied Finish by Armstrong World Industries, Inc.
c) Suspension Systems
    a. Armstrong World Industries, Inc.
d) Perimeter Trim Systems
    a. Armstrong World Industries, Inc.
e) Soffit Construction
    a. Armstrong World Industries, Inc. Drywall Grid SimpleSoffit™

2.2.1 ACOUSTICAL CEILING UNITS

a) Acoustical Panels

1) Surface Texture: Fine
2) Composition: Mineral Fiber
3) Color: White (Fine Texture Finish for ACOUSTIBuilt panels)
4) Size: 48 in x 72 in x 7/8 in - Item #2604
5) Edge Profile: Tapered edges four sides
6) Noise Reduction Coefficient (NRC): ASTM C 423; Panel 0.80 (UL)
7) Ceiling Attenuation Class (CAC): ASTM C 1414; Panel 46 (UL), System up to 48
8) Sabin: Cloud Applications: 0.80 Sabins/SF & 1.33 Sabins/SF with infill item 8200T10
9) Flame Spread: ASTM E 1264; Class A
10) Light Reflectance (LR) White Panel: ASTM E 1477; 0.87
11) Dimensional Stability: HumiGuard Plus
12) Recycle Content: Post-Consumer and Pre-Consumer – up to 75%
13) Material Ingredient Transparency: Health Product Declaration (HPD); Declare Label
14) Life Cycle Assessment: Third Party Certified Environment Product Declaration (EPD)
15) Acceptable Product: ACOUSTIBuilt panels #2604 No added formaldehyde as manufactured by Armstrong World Industries
16) Contact your local Armstrong Representative for required installation training at least 4-6 weeks before ordering materials and scheduling installation.

b) Finish

1. Joint Compound
    a. Setting Compound: Lightweight setting-type drywall joint compound, Ultra lightweight drying-type drywall joint compound
    b. Joint Tape: Self-Adhesive mesh drywall joint tape (Panel to Panel)
        1. Use Setting Type Compound for initial coats and use Drying Type Compound for final coats per the installation instructions. DO NOT use any other type of drywall compound such as All-Purpose Compound.
        2. Paper tape at the wall intersection
2. Spray Applied Finish – Required Product: #2605WH or 2605BL Fine Texture Finish for ACOUSTIBuilt panels – White as manufactured by Armstrong World Industries.

For information regarding the ACOUSTIBuilt products, contact your Armstrong Sales Representative:

https://www.armstrongceilings.com/commercial/en/rep-locator.html

c) Suspension Systems

1. Armstrong Drywall Suspension Systems all main beams and cross tees shall be commercial quality hot-dipped galvanized steel

i. Main beam: manufactured main beam- 1-1/2" knurled face with ScrewStop™ reverse hem by 1-11/16 inches high. Drywall Main Beams are factory punched with cross tee routs, hanger wire holes, and SuperLock™ main beam clip for a strong secure connection and fast accurate alignment. Drywall Main Beams are Heavy-duty performance per ASTM C635

ii. HD8906 - 12ft HD Drywall Main Beam 1-1/2 in

2. Cross Tees: manufactured cross tee- 1-1/2" knurled face with ScrewStop™ reverse hem by 1-1/2 inches high with factory punched cross tee routs and hanger wire holes and XL stake on clip for a strong secure connection.

i. XL8945P - 4ft Drywall Cross Tee

3. Wall Molding:

i. KAM12 - 12ft Knurled Angle Molding 1-1/4" Face

4. Hanger wire: a Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least time three times the design load, but not less than 12-gauge.

5. Fasteners (for Panel attachment)

i. #6 x 1-5/8” Fine thread drywall screws

ii. Recommended Adhesives: Loctite PL Premium Polyurethane Construction Adhesive, OSI F38 Drywall Panel Adhesive.

6. Perimeter Systems

i. Commercial quality extruded aluminum alloy 6063 trim channel, factory finished in baked polyester paint. Commercial quality galvanized steel unfinished T-bar connection clips; galvanized steel splice plates.

1. Color: White
2. Size: 120 in X 4 in (also available in 6”)
3. Recycle Content: Post-Consumer - 50% Pre-Consumer - 0%
4. Acceptable Product: AXIOM One Piece for Drywall, 4in Straight – AX1PC4STR or Curved AX1PC4CUR as manufactured by Armstrong World Industries

ii. Axiom Trim Channel:

1. AX4STR 4in Axiom Classic Straight
2. AX1PC4STR 4IN One –Piece Drywall Trim

iii. Axiom Bottom Trim with taping flange

1. AXBTASTR – Bottom Trim for ACOUSTIBuilt (also available in curved)

iv. Axiom Accessories:

1. AXSPLICE - Splice Plate

d) Material Ingredient Transparency: Health Product Declaration (HPD); Declare Label

e) Life Cycle Assessment: Third Party Certified Environmental Product Declaration (EPD)

II. PART 3 - EXECUTION

a) Prior to installation, contact your Armstrong Installation Systems Specialist (ISS). Before installation, inspect previous work of all other trades. Verify that all work is complete and

accurate to the point where this installation may properly proceed in strict accordance with framing shop drawings.

b) If framing preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

c) The system installation is similar to a conventional drywall installation. However, there are key differences in both material substrate and methods of finishing and installation that make this system unique. Installers should review and follow all written directions of the installation instructions and view the installation video.
https://www.armstrongceilings.com/commercial/en/commercial-ceilings-walls/acoustibuilt-ceiling-panels.html#!video=6034280272001

d) Installation: In accordance with all approved plans, details, and manufacturer's installation guidelines located in the Armstrong ACOUSTIBuilt Assembly and Installation Instructions (BPLA-299099) Click to follow to ACOUSTIBuilt Installation Instructions, and Drywall Grid Systems Hanging and Framing Flat Ceilings Installation Guides (BPCS3539) Click to follow to Hanging and Framing Flat Drywall Instructions.

1. Install seismic components if required by the building code. Seismic components to be specified on the architectural plans by the project engineer or design team.
2. Suspend main beam from overhead construction with hanger wires spaced 4-0 ft. on center along the length of the main runner. Install hanger wires plumb and straight.
3. 48” Cross tees shall be installed 16” on center. Extra cross tees are required at 72” every 12’. All 4 panel edges must be supported by a grid main or tee.
4. Install wall moldings/perimeter trim at intersection of suspended ceiling and vertical surfaces
5. Main runners and cross tees shall be attached at perimeter conditions
6. When determining the grid layout, consider the long edges of the boards must run parallel with the mains.
7. This system relies on a square grid system to ensure panel edges align at centers of cross tees. If the installation does not meet these squareness requirements, the panel edges may run off the grid system.
    i. The system must be square to within 1/8" over a 48" x 48" module.
    ii. The suspension system must be leveled to within 1/4" in 10'.
8. Floating perimeters must be trimmed with either Axiom® One-Piece Drywall Trim or Axiom® Classic with Bottom Trim for ACOUSTIBuilt™. Refer to the installation instructions for integration with ACOUSTIBuilt installations.
9. Install access doors where plenum access is required. Refer to the RCP for the location)

3.2.1 PREPARATION

a) Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations.

b) Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.

c) Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.2.3 INSTALLATION

Follow manufacturer installation instructions. Armstrong ACOUSTIBuilt Assembly and Installation Instructions (BPLA-299099) Click to follow to ACOUSTIBuilt Installation Instructions Check

A) Control joints are required following the standards used for gypsum board listed in ASTM C840, Section 20

I. Ceilings with perimeter relief cannot exceed 50 LF and 2500 SF between control joints

II. Ceilings without perimeter relief cannot exceed 30 LF and 900 SF between control joints

B) Panel joints and fasteners are finished with tape and compound to create a flat surface. While the materials used to finish ACOUSTIBuilt panels are also used to finish drywall, the procedure has unique requirements.

C) Joint compound coverage shall be limited to preserve the acoustical performance of the panels. Compound at panel joints shall not exceed 8 inch widths. Compound applied to field fasteners shall not exceed 2 inch by 2-inch areas. All compound shall be smooth and free of tool marks and ridges. Panels are to be finished with taping knives. Production tools, including boxes, are detailed on the installation instructions.

D) Sanding and inspection: Throughout the sanding process, inspect the surface frequently for flatness. Direct a light across the ceiling to highlight unevenness that requires attention.

E) Fine Texture Finish shall be applied in 4-5 coat process (additional coat may be used to achieve the desired finish) as called out in the installation instructions. Fine Texture Finish for ACOUSTIBuilt is applied in multiple coats, layered to achieve a uniform appearance and acoustical performance. It is strongly encouraged to practice spraying to ensure proper calibration and technique are achieved. Refer to the installation video.

I. ACOUSTIBuilt fine texture finish MUST be sprayed with a Graco Mark V texture system. This equipment properly atomizes the finish for acoustics and aesthetics. Fine texture finish is not intended for use with any other airless paint systems not recommended by Armstrong or to be applied by brush or rolling.

II. See Manufactures installation instructions for correct spray tip, pressure settings for spray system, finish preparation, spray calibration and spray procedure and technique.

3.2.4 ADJUSTING AND CLEANING

a) To remove soot, dirt, and dust use a vacuum operating at low power with a soft brush or use a dry soot cleaning sponge.

b) Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage.

End of Section

ACOUSTIBuilt™ FINISH SCHEDULE

ACT-1 Armstrong ACOUSTIBuilt™ Seamless Acoustical Ceiling System – Panel #2604 (48”x72”x7/8”), UL Classified NRC of 0.80 and tapered edges on all 4 sides. Panels are to be installed on Armstrong 1-1/2” Drywall grid system with Main Runner #HD8906 installed 4’0” OC, 4’Tee #XL8945P installed 16” OC and KAM wall angle #KAM1512. Finish joint seams and field to a level 4 finish with required joint compound. Color is to be white, black or any custom color. Spray with 4-5 coats of Fine Texture Finish #2605WH. The installed wall to wall system performance is to be NRC up to 0.80, CAC 48, Cloud installations are 0.80 Sabins/SF or 1.33 Sabins/SF with infill item 8200T10, LR .87(White only), Class A, BioBlock and HumiGuard Plus Sag Performance . Install all steps per the manufacturer’s installation instructions. Contact local Armstrong rep name here at xxx-xxx-xxxx and/or RepName@ArmstrongCeilings.com for required installation training at least 4-6 weeks before ordering materials and scheduling installation.

Accessories:
-Axiom One Piece 4” or 6” for floating conditions
-Axiom Classic 4” or 6” with Axiom Bottom Trim for AcoustiBuilt for floating conditions

SECTION 09 65 00
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring.

B. Resilient base.

C. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.

1.03 REFERENCE STANDARDS

A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.

B. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2004 (Reapproved 2010)e1.

C. ASTM F1861 - Standard Specification for Resilient Wall Base; 2008 (Reapproved 2012)e1.

1.04 SUBMITTALS

A. See Section 01330 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

D. Verification Samples: Submit two samples, 12 x24 inch in size illustrating color and pattern for each resilient flooring product specified.

E. Concrete Testing Standard: Submit a copy of ASTM F710.

F. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of sub-floor is acceptable.

G. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Materials: Quantity equivalent to 5 percent of each type and color.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

1.06 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.01 TILE FLOORING

A. Vinyl Composition Tile: Homogeneous, with color extending throughout thickness.

1. Minimum Requirements: Comply with ASTM F1066, of Class corresponding to type specified.
2. Size: 12 x 24 inch.
3. Thickness: 0.125 inch.
4. Pattern: Marbleized.
5. Manufacturers:
    a. Armstrong World Industries, Inc; Basis of Design: Excelon: www.armstrong.com.
    b. Johnsonite, a Tarkett Company: www.johnsonite.com.
    c. Mannington Mills, Inc: www.mannington.com.
    d. Substitutions: See Section 01 6000 - Product Requirements.

B. Luxury Vinyl Tile (LVT): Surface-decorated, with wear layer
1. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
2. Size: See drawings.
3. Thickness: 0.125 inch.
4. Pattern: See Drawings.
5. Manufacturers: See Drawings
    a. Substitutions: See Section 01 6000 - Product Requirements.

2.02 RESILIENT BASE

A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove.
1. Height: 4 inch.
2. Thickness: 0.125 inch thick.
3. Finish: Satin.
4. Length: Roll.
5. Color: Color as selected from manufacturer's standards.
6. Accessories: Premolded external corners and end stops.
7. Manufacturers:
    a. Burke Flooring: www.burkemercer.com.
    b. Flexco, www.flexcofloors.com
    b. Johnsonite, a Tarkett Company: www.johnsonite.com.
    c. Roppe Corp: www.roppe.com.
    d. Substitutions: See Section 01 6000 - Product Requirements.

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.

C. Sealer and Wax: Types recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.
1. Test in accordance with ASTM F710.
2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.

C. Prohibit traffic until filler is cured.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install in accordance with manufacturer's instructions.

C. Spread only enough adhesive to permit installation of materials before initial set.

D. Fit joints tightly.

E. Set flooring in place, press with heavy roller to attain full adhesion.

F. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

G. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless manufacturer's instructions say otherwise.

B. Lay flooring with joints and seams parallel to building lines to produce symmetrical tile pattern.

C. Install tile to checkerboard pattern alternating the direction of the pattern. Allow minimum 1/2 full size tile width at room or area perimeter.

3.05 RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Install base on solid backing. Bond tightly to wall and floor surfaces.

C. Scribe and fit to door frames and other interruptions.

3.06 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean, seal, and wax in accordance with manufacturer's instructions.

3.07 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

SECTION 09 65 13

RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data and Samples.

B. Extra Materials: Deliver to Owner at least 12 linear feet, of each type and color of resilient wall base installed.

PART 2 - PRODUCTS

2.1 WALL BASE rubber base.

A. Products:

1. Rubber 4” cove base – Flexco, Johnsonite, or approved equal

B. Color and Pattern: standard color to be selected

C. Group (Manufacturing Method): solid, homogeneous

D. Style: Cove (with top-set toe)

E. Minimum Thickness: 0.125 inch

F. Height: 4 inches

G. Lengths: Continuous roll stock

H. Outside Corners: premolded.

I. Inside Corners: premolded.

2.2 RESILIENT ACCESSORY

A. Products:

1. Flexco, Johnsonite, or approved equal

B. Color: Standard

C. Description: Carpet edge for glue-down applications Nosing for carpet Nosing for resilient floor covering.

D. Material: Rubber

E. Profile and Dimensions:

2.3 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement- or blended hydraulic cement-based formulation provided or approved by flooring manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit products and substrate conditions.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Prepare concrete substrates according to ASTM F 710. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

B. Adhesively install resilient wall base and accessories.

C. Install wall base in maximum lengths possible. Apply to walls, columns, pilasters, casework, and other permanent fixtures in rooms or areas where base is required.

D. Install reducer strips at edges of floor coverings that would otherwise be exposed.

END OF SECTION 09 65 13

SECTION 09 65 19

RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid vinyl floor tile.
2. Rubber floor tile.
3. Vinyl composition floor tile.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
3. Product Data: For chemical-bonding compounds, indicating VOC content.
4. Laboratory Test Reports: For chemical-bonding compounds, indicating compliance with requirements for low-emitting materials.
5. Product Data: For sealants, indicating VOC content.
6. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
7. Laboratory Test Reports: For flooring products, indicating compliance with requirements for low-emitting materials.
8. Environmental Product Declaration: For each product.
9. Health Product Declaration: For each product.
10. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
11. Environmental Product Declaration: For each product.
12. Environmental Product Declaration: For each product.
13. Environmental Product Declaration: For each product.
14. Third-Party Certifications: For each product.
15. Third-Party Certified Life Cycle Assessment: For each product.

C. Shop Drawings: For each type of resilient floor tile.

1. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
2. Show details of special patterns.

D. Samples: Full-size units of each color, texture, and pattern of floor tile required.

E. Samples for Initial Selection: For each type of floor tile indicated.

F. Samples for Verification: Full-size units of each color and pattern of floor tile required.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.7 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F 95 deg F.

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit

floor tile and substrate conditions indicated.

C. Seamless-Installation Accessories:

1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.
2. Colors: As selected by Architect from manufacturer's full range to contrast with floor tile.
3. Chemical-Bonding Compound: Manufacturer's product for chemically bonding seams.
4. Sealant shall have a VOC content of 250 g/L or less.
5. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
6. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
7. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
8. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
9. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.
10. Joint-Sealant Color: As selected by Architect from manufacturer's full range to match floor tile.

D. Sealers and Finish Coats for Resilient Terrazzo Floor Tile: Products recommended by floor tile manufacturer for resilient terrazzo floor tile.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion

of resilient products.

B. Concrete Substrates: Prepare according to ASTM F710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
4. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft, and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

C. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.

D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

E. Do not install floor tiles until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

F. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles in pattern of colors and sizes indicated.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles in pattern of colors and sizes indicated.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking

device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

I. Seamless Installation:

1. Heat-Welded Seams: Comply with ASTM F1516. Rout joints and heat weld with welding bead to fuse sections permanently into a seamless flooring installation. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.
2. Chemically Bonded Seams: Bond seams with chemical-bonding compound to fuse sections permanently into a seamless flooring installation. Prepare seams and apply compound to produce tightly fitted seams without gaps, overlays, or excess bonding compound on flooring surfaces.

J. Resilient Terrazzo Accessories: Install according to manufacturer's written instructions.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.

1. Apply 2 coat(s).

E. Joint Sealant: Apply sealant to resilient terrazzo floor tile perimeter and around columns, at door frames, and at other joints and penetrations.

F. Sealers and Finish Coats: Remove soil, visible adhesive, and surface blemishes from resilient terrazzo floor tile surfaces before applying liquid cleaners, sealers, and finish products.

1. Sealer: Apply two base coats of liquid sealer.
2. Finish: Apply 2 coats of liquid floor finish.

G. Cover floor tile until Substantial Completion.

END OF SECTION 09 65 19

SECTION 09 65 66
SHEET VINYL RESILIENT ATHLETIC FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Sheet vinyl resilient athletic flooring.

1.2 ALTERNATES

A. BASE BID: Provide manufacturer's flooring system with full-spread standard adhesive system.

B. ALTERNATE: Provide manufacturer's flooring system with full-spread high moisture adhesive capable of tolerating slab moisture exposure up to 100% relative humidity (RH) when tested according to ASTM F 2170.

C. Refer to Section 012300 – Alternates, for a description of work under this Section affected by alternates.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Manufacturer Certifications:

1. Provide certification that accurately identifies the Original Equipment Manufacturer (OEM) of flooring furnished for this project including manufacturer's name, address and factory location.

a. Suppliers of Private-Label flooring for this project must identify themselves as such and fully disclose the OEM information listed above.

b. All "manufacturer" requirements in these specifications must be complied with by the OEM, including warranties, certifications, qualifications, product data, test results, environmental requirements, performance data, etc.

2. Provide ISO 9001 certification for the OEM of the specified products.

3. Provide ISO 14001 certification for the OEM of the specified products.

C. Laboratory Test Results:

1. Provide certification of testing per ASTM F2772-11 and the product being furnished complies with the ASTM Indoor Sport Floor Classification specified for this project. Third-party certification required; sales literature is not sufficient.

D. Shop Drawings: Showing installation details and locations of borders, patterns, game lines, locations of floor inserts and seams.

E. Samples:

1. Manufacturer's color chart for selection of available floors with a minimum of 10 standard colors available, including 2 wood visuals.

2. Color samples:

a. Wood visual samples Minimum 24 inches by 36 inches to show that the appearance of wood plank pattern complies with these specifications

b. Solid color samples: Minimum 6 inches by 8 inches.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For a qualified resilient athletic flooring Manufacturer.

2. For a qualified resilient athletic flooring Installer.

1.5 CLOSEOUT SUBMITTALS

A. Submit three copies of the following:

1. Manufacturer maintenance instructions.

2. Manufacturer warranty.

a. BASE BID PRODUCT: Manufacturer warranty for material defects.

b. ALTERNATE PRODUCT: Manufacturer warranty for material defects, high moisture tolerance and not promoting mold growth on, within and directly under the installed flooring.

3. Installer installation warranty.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. ISO 9001 Certified.

2. ISO 14001 Certified.

3. At least ten years active experience in the manufacture and marketing of indoor resilient athletic flooring.

4. A provider of authorized installer training.

B. Installer Qualifications:

1. At least five years experience in the installation of resilient athletic flooring.

2. Experience on at least five projects of similar size, type and complexity as this project.

3. Employer of workers for this Project who are competent in techniques required by manufacturer for resilient athletic flooring installation indicated.

C. Fire Test Characteristics: As determined by testing identical products according to ASTM E 648, Class 1, by a qualified testing agency acceptable to authorities having jurisdiction.

D. Athletic Performance Properties: Comply with ASTM F 2772-11 Performance Level Class 3 for force reduction, ball bounce, vertical deformation and surface friction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store flooring and installation materials in protected dry spaces, with ambient temperatures maintained within range recommended by manufacturer, but not less than 55 deg F (13 deg C) nor more than 85 deg F (29 deg C).

B. Store the indoor resilient athletic surfacing rolls in an upright position on a smooth flat surface immediately upon delivery to Project.

1.8 FIELD CONDITIONS

A. Product Installation:

1. Maintain temperatures during installation within range recommended by manufacturer, but not less than 65 deg F (18 deg C) in spaces to receive flooring 48 hours prior, during and 48 hours after installation.

2. After installation, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 85 deg F (29 deg C).

3. Prohibit traffic during flooring installation and for at least 48 hours after flooring installation.

B. Install flooring only after other finishing work, including painting and overhead work, has been completed.

1.9 WARRANTY

A. Special Limited Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace sports flooring that fails within specified warranty period.

1. Material warranty must be direct from the product manufacturer.

a. Material warranties from private label distributors are not valid.

2. Failures include, but are not limited to, the following:

a. Material manufacturing defects.

b. Failure due to substrate moisture exposure:

1) BASE BID PRODUCT: Not to exceed 95% relative humidity (RH) when tested according to ASTM F 2170.

2) ALTERNATE PRODUCT: Up to 100% relative humidity (RH) when tested according to ASTM F 2170. In addition, ALTERNATE is warranted not to promote mold growth on, within and directly under the installed flooring.

3. Warranty Period: 15 years from date of Substantial Completion.

B. Special Limited Warranty: Installer's standard form in which installer agrees to repair or replace sports flooring that fails due to poor workmanship or faulty installation within the specified warranty period.

1. Warranty Period: 2 years from date of Substantial Completion.

1.10 ENVIRONMENT AND INDOOR AIR QUALITY

A. LEED™ Documentation:

1. MR Credits: For products having recycled content, indicate percentage by weight of post-consumer and pre-consumer recycled content.

2. IEQ Credits: For adhesives and flooring, including a statement of VOC content.

B. Indoor Air Quality Certification:

1. Flooring products must be FloorScore® Certified.

a. FloorScore® certification proves compliance with the volatile organic compound emissions criteria of the California Section 01350 standard.

b. FloorScore® certification proves compliance with the testing and product requirements of the California Department of Health Services “Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers.”

c. FloorScore® documentation must include certificate number for specified product.

2. Manufacturer’s certification of factory applied permanent Bacteriostatic and Fungicidal Treatment throughout the flooring material which can improve indoor air quality and reduce asthma and allergy risks associated with bacterial and mold growth.

C. Manufacturer Certification of Environmental Procedures:

1. Original Equipment Manufacturer’s (OEM) ISO 14001 Certification

1.11 COORDINATION

A. Coordinate layout and installation of flooring with other gymnasium equipment.

PART 2 - PRODUCTS

2.1 SHEET VINYL ATHLETIC FLOORING

A. Basis-of-Design Manufacture: Subject to compliance with requirements, provide

1. BASE BID PRODUCT: Gerflor Taraflex Sport M Performance Sports Flooring installed with standard full-spread adhesive.

2. ALTERNATE PRODUCT: Gerflor Taraflex Sport M Performance DRY-TEX Sports Flooring installed with Gerpur high-moisture tolerance full-spread adhesive.

B. Product Description: Dual-durometer foam-backed sheet vinyl flooring designed for fully adhered athletic flooring applications.

1. Overall Thickness: Not less than 0.35 inch (9 mm).

2. Wear-Layer Thickness: Not less than 0.08 inch (2.1 mm)

3. Backing:

a. Very high density, two layer, dual-durometer, closed cell foam

b. Two (2) layers of fiberglass reinforcement for dimensional stability and indentation resistance. One layer of woven grid fiberglass and an additional layer of non-woven fiberglass.

4. Seaming Method: Heat welded.

5. Adhesive Method:

a. Full-spread adhesive coverage to completely adhere flooring to substrate.

b. Complete adhesive coverage to eliminate the possibility of gaps or space between the slab and flooring material where moisture could accumulate and create an environment conducive to mold growth.

c. Flooring to be fully adhered to the concrete slab in all locations eliminating the possibility of waves or wrinkles forming caused by the floor shifting, moving or by rolling loads displacing it.

6. Traffic-Surface Texture: Wood visual shall have wood grain embossed texture for a genuine wood appearance and Solid colors to have “pebbled” embossed texture for an attractive appearance.

7. Bacteriostatic and Fungicidal Treatment: Manufacturer’s factory-applied permanent treatment throughout the flooring material which can improve indoor air quality and reduce asthma and allergy risks associated with bacterial and mold growth.

a. Basis-of-Design Product: Gerflor Sanosol

8. Applied Finish: Manufacturer's, factory-applied, permanent and UV-cured.

a. No-Wax finish: Published product literature identifying factory applied finish as, “No-Wax-Just clean and rinse”

b. Basis-of-Design Product: Gerflor Protecsol.

9. Field-Applied Finishes: None required and not allowed.

10. Roll Size:

a. Roll Width: Rolls to be a minimum width of 59 inches (1.5 m) wide.

b. Roll Length:

1) Wood visual rolls to be a minimum length of 86 feet, 6 inches (26.4 m) to minimize the number of end-seams.

2) Solid color rolls to be a minimum length of 67 feet, 3 inches (20.5 m) to minimize the amount of waste if accent colors are selected for boarders, keys or center circle.

c. Roll length of wood visual flooring shall be sufficient to cover the full length of a high school main basketball court (84’-0”) without splicing or end-of-roll (butt) seams within main court boundary.

11. Color and Pattern:

a. As selected by Owner from manufacturer's standard colors and patterns.

b. Wood pattern shall accurately simulate the true visual appearance of natural athletic wood strip flooring.

1) Pattern shall replicate random-length stock by simulating non-uniform board lengths ranging from 18 inches to 48 inches with a maximum board width of 2-1/2 inches.

2) Wood pattern shall not include a dark line simulating edges or ends of individual boards.

3) Surface texture shall simulate realistic wood grain and not be raised or "pebbled" embossing.

C. Performance Criteria:

1. ASTM F 2772-11 Indoor Sport Floor Standard:

a. Provide certification of compliance for the four ASTM F2772 Indoor Sport Floor Standard performance categories:

1) Shock Absorption/Force Reduction:

a) Class C3 (34% to 45%). Pass

2) Ball Bounce:

a) Minimum 90%: Pass

3) Surface effect/Coefficient of Friction:

a) Between 80-110: Pass

4) Vertical deformation:

a) Maximum 3.5mm: Pass

2. Resistance to Rolling Load: EN 1569; Pass.

3. Chemical Resistance: ASTM D 543; OK.

4. Impact Resistance: EN 1517; Pass.

5. Abrasion Resistance: EN ISO 5470; Pass.

6. Sound Insulation: EN ISO 717; 18 dB.

7. Gloss/Brightness: EN ISO 2813; Pass.

8. Organic Emission: ASTM D 5116; Pass

9. Fire Performance: ASTM E 648; Greater than 0.45 W/cm2, Class 1.

10. Surface Maintenance Requirements: No-wax surface requiring only cleaning and rinsing.

11. Slab Moisture Design Tolerance:

a. BASE BID PRODUCT: Maximum relative humidity (RH) of 95% when tested according to ASTM F 2170.

b. ALTERNATE PRODUCT: Up to 100% relative humidity (RH) when tested according to ASTM F 2170.

2.2 ACCESSORIES

A. Trowelable patching compound for standard slab surface preparation: Latex-modified, hydraulic-cement-based formulation provided by flooring manufacturer.

a. Basis-of-Design Product: GerPatch, Gerflor's patching compound.

b. Slab moisture tolerance: Same slab moisture tolerance as the adhesive.

B. Adhesive: Water-resistant type recommended by athletic flooring manufacturer for substrate and conditions indicated. Coverage Type: Full-spread application.

1. BASE BID PRODUCT:

a. Basis-of-Design Product: Gerflor Gerfix Spray adhesive.

b. Coverage: Full-spread application for 100% coverage.

c. Moisture Resistance: 95% relative humidity (RH) when tested according to ASTM F 2170.

2. ALTERNATE PRODUCT:

a. Basis-of-Design Product: Gerflor Gerpur adhesive for Dry-Tex high moisture system.

b. Coverage: Full-spread application for 100% coverage.

c. Moisture Resistance: Up to 100% relative humidity (RH) when tested according to ASTM F 2170.

C. Heat Welding Rod: As supplied by indoor resilient athletic flooring manufacturer. Color shall blend with resilient athletic flooring color.

D. Game-Line and Marker Paint: Complete system including primer, compatible with flooring and recommended by flooring and paint manufacturers.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify the Following:

1. The area in which the indoor resilient athletic flooring will be installed is dry, weather-tight and in compliance with specified requirements.

2. Permanent heat, lighting and ventilation systems are installed and operable.

3. Other work, including overhead work, that could cause damage, dirt, dust or otherwise interrupt installation has been completed or suspended.

4. No foreign materials or objects are present on the substrate and that it is clean and ready for preparation and installation.

5. Tests to verify that the moisture evaporative rate or substrate relative humidity is within the specified ranges.

6. The concrete slab surface pH level is within the specified range.

7. The concrete slab surface deviation is no greater than 3/16 inch within 10 feet (3.2 mm within 3 m) when measured according to ASTM E 1155.

8. The concrete slab complies with ACI 302.2R for concrete design including use of a low-permeance vapor barrier directly beneath the concrete subfloor with sealed penetrations.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written recommendations to ensure proper adhesion of resilient athletic flooring system.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of sealers, curing compounds and other additives. Remove coatings and other substances that are incompatible with adhesives using mechanical methods recommended by manufacturer.

2. Alkalinity Testing: Perform pH testing according to ASTM F 710. Proceed with installation only if pH readings are between 7.0 and 8.5.

C. Moisture Testing: Perform ASTM F 2170 relative humidity test and proceed with installation only after substrates have relative humidity levels below the maximum allowed.

D. Use Gerflor's GerPatch trowelable concrete based patching compound with the same moisture vapor tolerance as the adhesive to fill depressions, holes, cracks, grooves or other irregularities in substrate.

E. Place flooring and installation materials into spaces where they will be installed at least 48 hours before installation. Install flooring materials only after they have reached the same temperature as space where they are to be installed.

F. Sand the surface of the concrete slab.

G. Sweep and then vacuum substrates immediately before installation. After cleaning, examine substrate for moisture, alkaline salts, grit, dust or other contamination. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 SHEET ATHLETIC FLOORING INSTALLATION

A. General:

1. Comply with resilient athletic flooring manufacturer's installation instructions.

2. Take necessary precautions to minimize noise, odors, dust and inconvenience during installation.

3. Fit flooring neatly and tightly to vertical surfaces, equipment anchors, floor outlets, and other interruptions of floor surface.

4. Extend flooring into toe spaces, door reveals, closets, and similar openings unless otherwise indicated.

B. Lay out flooring as follows:

1. Minimize number of seams and place them inconspicuous areas.

2. Locate seams as shown on approved Shop Drawings

C. Adhered Flooring: Attach products to substrates using a full-spread of adhesive applied to substrate to comply with adhesive and flooring manufacturer instructions.

D. Vinyl Sheet Flooring Seams: Finish seams to produce surfaces flush with adjoining flooring surfaces. Comply with ASTM F 1516. Rout joints and use heat welding rod to permanently and seamlessly fuse sections together.

3.4 GAME LINES AND LOGOS

A. Lay out game lines and logos to comply with rules and diagrams published by National Federation of State High School Association for the sports activities indicated.

B. Mask flooring at game lines and logos, and apply paint of color indicated to produce clean, sharp and distinct edges.

3.5 CLEANING AND PROTECTION

A. Perform the following operations after completing resilient athletic flooring installation:

1. Remove marks and blemishes from flooring surfaces.

2. Sweep and then vacuum flooring.

3. Damp-mop flooring to remove soiling.

B. Protect flooring from abrasions, indentations, and other damage from subsequent operations and placement of equipment, during remainder of construction period.

END OF SECTION

SECTION 09 68 13
TILE CARPETING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes multi-level pattern loop and multi-level pattern cut and loop.

B. Related Requirements:
   1. Section 09 6513 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.
   2. Section 09 6816 "Sheet Carpeting."

1.03 SUBMITTALS

A. Product Data: For each type of product.
   1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
   2. Include installation recommendations for each type of substrate.

B. Shop Drawings: Show the following:
   1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
   2. Carpet tile type, color, and dye lot.
   3. Type of subfloor.
   4. Type of installation.
   5. Pattern of installation.
   6. Pattern type, location, and direction.
   7. Pile direction.
   8. Type, color, and location of insets and borders.
   9. Type, color, and location of edge, transition, and other accessory strips.
   10. Transition details to other flooring materials.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
   1. Carpet Tile: Full-size Sample.
   2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- long Samples.

D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.05 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
   1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
   2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.06 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

B. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
   1. Build mockups at locations and in sizes shown on Drawings.
   2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104.

1.09 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

1.10 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
   1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
   2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, and delamination.
   3. Warranty Period: Lifetime commercial limited from date of Substantial Completion.

PART 2 PRODUCTS

2.01 CARPET TILE

A. Basis of Design: Subject to compliance with requirements, provide the products listed in the Drawing “FINISH LEGEND” or products comparable in color, pattern, and physical attributes to those specified as approve by the architect.

B. Size: 24 inch by 24 inch unless otherwise indicated in the Drawing Finish Legend.

C. Applied Soil-Resistance Treatment: Manufacturer's standard material.

D. Antimicrobial Treatment: Manufacturer's standard material.

E. Performance Characteristics: As follows:
   1. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm.
   2. Dry Breaking Strength: Not less than 100 lbf per ASTM D 2646.
   3. Delamination: Not less than 3.5 lbf/in. per ASTM D 3936.
   4. Dimensional Tolerance: Within 1/32 inch of specified size dimensions, as determined by physical measurement.
   5. Dimensional Stability: 0.2 percent or less per ISO 2551 (Aachen Test).
   6. Resistance to Insects: Comply with AATCC 24.
   7. Colorfastness to Crocking: Not less than 4, wet and dry, per AATCC 165.

8. Colorfastness to Light: Not less than 4 after 40 AFU (AATCC fading units) per AATCC 16, Option E.
9. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria; not less than 1-mm halo of inhibition for gram-negative bacteria; no fungal growth; per AATCC 174.
10. Electrostatic Propensity: Less than 3.5 kV per AATCC 134.

F. Environmental Requirements: Provide carpet tile that complies with testing and product requirements of Carpet and Rug Institute's "Green Label Plus" program.

2.02 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Rubber Edge Strips: Rubber or vinyl in manufacturer’s standard matching carpet, of width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
    a. In-Situ Probe Test: Test for moisture by relative humidity probe and digital meter method according to ASTM F 2170. Proceed with installation only after substrates have a maximum relative-humidity-measurement reading of 70 to 75 percent in 72 hours.
2. Subfloor finishes comply with requirements specified in Division 03 Section "Cast-in-Place Concrete" for slabs receiving carpet tile.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.
1. Use of water based adhesives with the floor covering installations require an underlayment system with primer prior to the installation of the flooring system. Coordinate with the adhesive manufacturer for minimum recommended thickness of cementitious underlayment to absorb excess moisture in the adhesive.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.03 INSTALLATION

A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer.

C. Maintain dye lot integrity. Do not mix dye lots in same area.

D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

G. Install pattern parallel to walls and borders.

3.04 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:
   1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
   2. Remove yarns that protrude from carpet tile surface.
   3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION

SECTION 09 83 11
ACOUSTICAL WALL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabric-covered acoustical wall systems.

B. Accessories as required for complete installation.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

B. Section 01 6000 - Product Requirements: Substitution procedures.

1.03 REFERENCE STANDARDS

A. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use; 2009.

B. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2009a.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

D. ASTM E2573 - Standard Practice for Specimen Preparation and Mounting of Site-Fabricated Stretch Systems to Assess Surface Burning Characteristics; 2012.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Specimen warranty.

C. Test Reports: Certified test data from an independent test agency verifying that wall systems meet specified requirements for acoustical and fire performance.

D. Shop Drawings: Elevations indicating proposed locations of fabric seams and details indicating typical transitions to other finish surfaces.

E. Selection Samples: Fabric swatches representing manufacturer's full range of available colors, textures, and patterns.

F. Verification Samples:
   1. For each fabric specified, minimum size 8 inches square, representing actual product in color, texture, and pattern.
   2. Actual samples of all track profiles to be employed, including transitions between dissimilar profiles.
   3. Acoustical backing material, minimum 12 inches square.

G. Maintenance Contract.

H. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Supply an additional 5 percent of fabric installed for Owner's use in maintenance of project.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Provide all components of acoustical wall systems by a single manufacturer, including recommended primers, adhesives, and sealants.

B. Installer Qualifications: Firm specializing in site-fabricated wall systems, with not less than 5 years of documented experience in installing wall systems of the type specified, and approved by the manufacturer.

C. Mock-Up: Provide a mock-up for evaluation of application workmanship.
   1. Finish areas designated by Architect.
   2. Do not proceed with remaining work until workmanship and overall appearance are approved by Architect.
   3. Refinish mock-up area as required to produce acceptable workmanship.
   4. Approved mock-up may remain as part of the completed Work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect fabric, acoustical backing, and track from excessive moisture in shipment, storage, and handling. Do not deliver materials to project until wet work such as concrete and plaster has been completed.

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

A. Do not begin installation until interior conditions have reached temperature and humidity that will be maintained during occupancy. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.08 WARRANTY

A. Correct defective Work within a 3-year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

2.02 ACOUSTICAL WALL SYSTEM

A. Basis of Design: Armstrong Soundsoak 85, see Finish drawings for panel configuration and size, and custom fabric color and pattern.
   1. Thickness: 1 inch
   2. Edge Profile: Half Bevel
   3. Acoustical Performance: NRC 0.80

2.03 ACCESSORIES

A. Fasteners: As recommended by manufacturer of acoustical wall system for project conditions.

B. Adhesives: Low VOC or water-based, approved by wall system manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Verify that all casework, markerboards, door and window jambs, finished ceiling, and other finished items abutting acoustical wall systems have been installed.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove wall plates and other obstacles, and prepare substrates to receive core material in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Install acoustical wall systems at locations indicated , complying with manufacturer's instructions.

3.04 CLEANING

A. Clean exposed surfaces of acoustical wall system, complying with manufacturer's instructions for cleaning and repair of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.05 PROTECTION

A. Protect installed products until completion of project, using methods that will ensure that the finished work will be without damage or deterioration at Date of Substantial Completion.

3.06 MAINTENANCE

A. See Section 01 7000 - Execution Requirements, for additional requirements relating to maintenance service.

B. Provide a separate maintenance contract for specified maintenance service.

C. Replace damaged, soiled, or vandalized acoustical wall panels for up to 3 years from Date of Substantial Completion.

D. Replacement of up to 10 percent of the originally installed panels shall be at no additional cost to Owner.

E. Replacement of defective panels covered under warranty provisions is not included in this maintenance service.

END OF SECTION

SECTION 09 84 10.13
FOAM SOUND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sound absorbing foam.

1.02 REFERENCES

A. ANSI Z97.1 - Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.

B. American Society for Testing and Materials (ASTM):
   1. ASTM C423 - Sound Absorption by Reverberation Room Method.
   2. ASTM C635 - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
   3. ASTM D2240 - Standard Test Method for Rubber PropertyDurometer Hardness.
   4. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
   5. ASTM E413 - Classification for Rating Sound Insulation.
   6. National Fire Protection Association (NFPA) 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
   7. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

1.03 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.

B. Test Reports: Upon request submit certified test reports from recognized test laboratories.

C. Certificates: Submit manufacturer's certificate that products meet or exceed specified requirements.

D. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square representing actual product, color, and patterns.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 5 year experience manufacturing similar products.

B. Installer Qualifications: Minimum 2 year experience installing projects of similar size and complexity.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver material in the manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Provide labels indicating brand name, source of procurement, style, size and thickness.

C. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

D. Handling: Handle materials to avoid damage.

1.06 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.07 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.08 WARRANTY

A. Warranty Period: One year.

1.09 EXTRA MATERIALS

A. Extra Materials: Provide 10 percent for use by owner in building maintenance and repair.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Basis of Design Netwell Noise Control, www.controlnoise.com

2.02 SOUND ABSORBING FOAM

A. Pyramid Panels: Pyramid Plus
   1. Construction: Melamine acoustical foam; Class A fire retardant.
   2. Material: Open cell melamine acoustical foam.
   3. Pattern: Pyramid for monolithic appearance
   4. Thickness: 2 inches (51 mm).
   5. NRC 2 inches (51 mm): 0.70.
   6. Size: Nominal 24 inches x 24 inches (610 mm x 610 mm)
   7. Density: 2 lb/pcf
   8. Color: As selected by Architect.
   9. Flammability: ASTM E84, Class 1. Flame Spread: 5; Smoke Developed: 50.
   10. Installation: Acoustical Adhesive and Mechanical fasteners / Screws.

PART 3 EXECUTION

3.01 EXAMINATION

A. Site Verification of Conditions:
   1. Examine surfaces scheduled to receive furred out or directly attached acoustical units for unevenness, irregularities and dampness that would affect quality and execution of work.
   2. Do not proceed with installation of acoustical panels until unacceptable conditions are corrected.

B. Environmental Requirements:
   1. Do not install acoustical panels until building is closed in and HVAC system is operational.

3.02 INSTALLATION - GENERAL

A. General: Do not begin installation until materials sufficient to complete an entire room are received and are ready for installation.
   1. Field cut acoustical panels as required, in accordance with manufacturers recommended procedures and equipment.
   2. Install acoustical wall panels in accordance with quantity and lay-outs as shown on the architectural drawings.
   3. Acoustical wall panels shall be adhesively or mechanically mounted in accordance with manufacturer's recommendations and/or as detailed on the drawings.

B. Manufacturer's Instructions:
   1. Comply with the instructions and recommendations of the acoustical panel manufacturer.
   2. Install materials in accordance with governing regulations, fire resistance rating requirements and industry standards applicable to work.

3.03 PANEL MOUNTING

A. Adhesive Mounting: Panels are to be installed per recommended adhesive instructions.

3.04 CLEANING

A. Clean exposed surfaces of acoustical panel to comply with manufacturer's instructions for cleaning.

B. Remove and replace tiles, which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.05 PROTECTION

A. Protect installed work from damage due to subsequent construction activity, including temperature and humidity limitations and dust control, so that the work will be without damage and deterioration at the time of acceptance by the Owner.

END OF SECTION

SECTION 09 90 00
PAINTING AND COATING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints, stains, and other coatings.

C. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. Ladders.
   3. Exposed surfaces of steel lintels and ledge angles.
   4. Prime surfaces to receive wall coverings.
   5. Mechanical and Electrical:
      a. In finished areas, paint all conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, electrical equipment, and exposed pipe, unless otherwise indicated.
      b. In finished areas, paint shop-primed items.
      c. On the roof and outdoors, paint all equipment that is exposed to weather or to view, except that which is factory-finished.
      d. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.

D. Do Not Paint or Finish the Following Items:
   1. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Non-metallic roofing and flashing.
   6. Stainless steel, anodized aluminum, bronze, terne, and lead items.
   7. Marble, granite, slate, and other natural stones.
   8. Floors, unless specifically so indicated.
   9. Ceramic and other tiles.
   10. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
   11. Exterior insulation and finish system (EIFS).
   12. Glass.
   13. Acoustical materials, unless specifically so indicated.
   14. Concealed pipes, ducts, and conduits.

1.02 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this section.

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2012.

C. ASTM D 4262 - Standard Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces; 2005.

D. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials; 2007.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Samples: Submit two painted samples, illustrating selected colors and textures for each color and system selected with specified coats cascaded. Submit on paper, 8-1/2 x 11 inch in size.

C. Certification: By manufacturer that all paints and coatings comply with VOC limits specified.

D. Certification: By manufacturer that all paints and coatings do not contain any of the prohibited chemicals specified; GreenSeal GS-11 certification is not required but if provided shall constitute acceptable certification.

E. Manufacturer's Instructions: Indicate special surface preparation procedures.

F. Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Paint and Coatings: Not less than 1 gallon of each color and type properly sealed from lots furnished for the Work; store where directed.
   3. Label each container with color, type, and texture in addition to the manufacturer's label.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience.

1.06 MOCK-UP

A. See Section 01 4000 - Quality Requirements, for general requirements for mock-up.

B. Provide panel, 6 feet long by 3 feet wide, illustrating standard and custom coating color, texture, and finish. Specific colors for mock-up to be selected by Architect.

C. Provide door and frame assembly illustrating paint coating color, texture, and finish.

D. Locate where directed.

E. Mock-up may remain as part of the work if approved by Architect.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

E. Minimum Application Temperature for Varnish Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.

F. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide all paint and coating products used in any individual system from the same manufacturer; no exceptions.

B. Provide all paint and coating products from the same manufacturer to the greatest extent possible.

C. In the event that a single manufacturer cannot provide all specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.

D. Paints: Acceptable manufacturers are limited to the following:
   1. Farrell Calhoun Paints: www.farrellcalhoun.com.
   2. ICI Paints: www.icipaints.com.
   3. Benjamin Moore & Co: www.benjaminmoore.com.
   4. Sherwin-Williams Company: www.sherwin-williams.com.

E. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PAINTS AND COATINGS - GENERAL

A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
   1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
   3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
   4. Supply each coating material in quantity required to complete entire project's work from a single production run.
   5. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.

B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

C. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, commercial quality.

D. Patching Material: Latex filler.

E. Fastener Head Cover Material: Latex.

F. Volatile Organic Compound (VOC) Content:
   1. Provide coatings that comply with the most stringent requirements specified in the following:
      a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
   2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

G. Chemical Content: The following compounds are prohibited:
   1. Aromatic Compounds: In excess of 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
   2. Acrolein, acrylonitrile, antimony, benzene, butyl benzyl phthalate, cadmium, di (2-ethylhexyl) phthalate, di-n-butyl phthalate, di-n-octyl phthalate, 1,2-dichlorobenzene, diethyl phthalate, dimethyl phthalate, ethylbenzene, formaldehyde, hexavalent chromium, isophorone, lead, mercury, methyl ethyl ketone, methyl isobutyl ketone, methylene chloride, naphthalene, toluene (methylbenzene), 1,1,1-trichloroethane, vinyl chloride.

H. Flammability: Comply with applicable code for surface burning characteristics.

I. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

J. Colors: As indicated in the finish schedule.
   1. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.
   2. Extend colors to surface edges; colors may change at any edge as directed by Architect.
   3. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.
   4. In utility areas, finish equipment, piping, conduit, and exposed duct work in colors according to the color schedule on the Finish Schedule.

2.03 PAINT SYSTEMS - EXTERIOR

A. Concrete/Masonry, Opaque, Alkyd, 3 Coat:
   1. One coat of block filler.
   2. Semi-gloss: Two coats of alkyd enamel.
   3. Flat: Two coats of alkyd enamel.

B. Ferrous Metals, Unprimed, Alkyd, 3 Coat:
   1. One coat of alkyd primer.
   2. Gloss: Two coats of alkyd enamel.
   3. Semi-gloss: Two coats of alkyd enamel.

C. Ferrous Metals, Primed, Alkyd, 2 Coat:
   1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
   2. Gloss: Two coats of alkyd enamel.
   3. Semi-gloss: Two coats of alkyd enamel.

D. Galvanized Metals, Alkyd, 3 Coat:
   1. One coat galvanize primer.
   2. Gloss: Two coats of alkyd enamel.
   3. Semi-gloss: Two coats of alkyd enamel.

2.04 PAINT SYSTEMS - INTERIOR

A. Wood, Opaque, Alkyd, 3 Coat:
   1. One coat alkyd primer sealer.
   2. Semi-gloss: Two coats of alkyd enamel.
   3. Eggshell: Two coats of alkyd enamel.
   4. Flat: Two coats of alkyd enamel.

B. Wood, Opaque, Latex, 3 Coat:
   1. One coat of latex primer sealer.
   2. Semi-gloss: Two coats of latex enamel.
   3. Eggshell: Two coats of latex enamel.
   4. Flat: Two coats of latex enamel.

C. Wood, Transparent, Varnish, Stain:
   1. Filler coat (for open grained wood only).

2. Two coats of stain.
3. One coat sealer.
4. Satin: Two coats of varnish.
5. Flat: Two coats of varnish.

D. Ferrous Metals, Unprimed, Alkyd, 3 Coat:
1. One coat of alkyd primer.
2. Gloss: Two coats of alkyd enamel.
3. Semi-gloss: Two coats of alkyd enamel.

E. Ferrous Metals, Primed, Alkyd, 2 Coat:
1. Touch-up with alkyd primer.
2. Gloss: Two coats of alkyd enamel.
3. Semi-gloss: Two coats of alkyd enamel.

F. Galvanized Metals, Alkyd, 3 Coat:
1. One coat galvanize primer.
2. Gloss: Two coats of alkyd enamel.
3. Semi-gloss: Two coats of alkyd enamel.

G. Gypsum Board/Plaster, Latex-Acrylic, 3 Coat:
1. One coat of alkyd primer sealer.
2. Egg Shell: Two coats of latex-acrylic enamel.

H. Concrete Floor Stain:
1. Penetrating, acid based chemical stain.
2. Stain: 2 coats.
3. Sealer: As recommended by stain manufacturer.
4. Refer to finish schedule for manufacturer and color.

I. Overhead exposed structure, piping, ductwork:
1. SW DryFall.
2. SW DryFall.

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of coatings until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

E. Test shop-applied primer for compatibility with subsequent cover materials; report incompatible primer conditions and submit recommended changes for the Architect's approval.

F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
1. Gypsum Wallboard: 12 percent.

2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
4. Concrete Floors and Traffic Surfaces: 8 percent.

G. Measure the ph factor of concrete, masonry and mortar in accordance with ASTM D 4262 before starting any finishing process.
1. Report results in writing to Architect before starting work.
2. If results of test indicates need for remedial action, provide written description of remedial action. Do not proceed with remedial action without receiving written authorization from Architect.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to coating application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Surfaces: Correct defects and clean surfaces which affect work of this section. Remove or repair existing coatings that exhibit surface defects.

D. Coordinate painting work with cleaning and preparation work so that dust and other contaminates do not fall on newly painted, wet surfaces.

E. Surface Appurtenances: Prior to preparing surfaces or finishing, remove or mask electrical plates, hardware, light fixtures, light fixture trim, escutcheons, machined surfaces, fittings and similar items already installed that are not to be painted.
1. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before preparation and finishing.
2. After completing painting in each space or area, reinstall items removed using workers skilled in the trades involved.

F. Marks: Seal with shellac those that might cause bleed through or staining of topcoat.

G. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

H. Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.

I. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.

J. Concrete Floors and Traffic Surfaces to be Stained: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

K. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
1. Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical or chemical methods as recommended as best practice by primer manufacturer.

L. Corroded Steel and Iron Surfaces to be Painted: Prepare using at least SSPC-PC 2 (hand tool cleaning) or SSPC-SP 3 (power tool cleaning) followed by SSPC-SP 1 (solvent cleaning).

M. Uncorroded, Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.

1. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by coating manufacturer and touch up with the same primer as the shop coat.

N. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.

O. Interior Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

P. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's instructions and as specified using the preparation, products, sheens, textures and colors as indicated on the finish schedule.
   1. Provide completed work matching approved samples for color, texture and coverage.
   2. Remove, refinish or repaint work not complying with requirements.

C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

E. Do not apply finishes over dirt, rust, scale, grease, moisture, scuffed surfaces or other conditions detrimental to formation of a durable coating film.

F. Apply each coat to uniform appearance.

G. Use applicators and methods best suited for substrate and type of material being applied and according to manufacturer's instructions.
   1. Brush Application: Use brushes best suited for the type of material applied; use brush of appropriate size for the surface or item being painted; produce results free of visible brush marks.
   2. Roller Application: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
   3. Spray Application: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

H. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate; provide total dry film thickness of entire system as recommended by manufacturer.
   1. Number of coats and film thickness required are the same regardless of application method.
   2. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance.
   3. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive dry film thickness equivalent to that of flat surfaces.

I. Apply finish to completely cover surfaces with uniform appearance without brush marks, runs, sags, laps, ropiness, holidays, spotting, cloudiness or other surface imperfections.
   1. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.
   2. Before applying finish coats, apply a prime coat of material recommended by manufacturer, unless the surface has been prime coated by others; where evidence of suction spots or unsealed areas in first coat appear, recoat primed and sealed surfaces to ensure finish coat with no burn through or other defects due to insufficient sealing.

3. Apply first coat to surface that has been cleaned, pretreated, or otherwise prepared as soon as practical after preparation and before subsequent surface deterioration.
4. Do not apply succeeding coats until the previous coat has cured as recommended by manufacturer.
5. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure and application of another coat will not cause the undercoat to lift or lose adhesion.
6. Pigmented (Opaque) Finishes: Provide smooth, opaque surface of uniform finish, color, appearance, and coverage.

J. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.

K. If manufacturer's instructions recommend sanding wood and metal surfaces to produce a smooth, even surface sand lightly between coats to achieve required finish.

L. Before applying next coat vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

M. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

B. At the end of each workday, remove empty cans, rags, rubbish and other discarded paint materials from site.

C. Protect other work, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing and repainting as approved by Architect.

D. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

E. At completion of construction activities of other trades, touch up and restore damage or defaced painted surfaces. Comply with procedures specified by the coating manufacturer.

3.05 PROTECTION

A. Protect finished coatings until completion of project.

B. Touch-up damaged coatings after Substantial Completion.

3.06 SCHEDULE

A. Refer to Finish Schedule for paint manufacturers, colors, sheens, textures, etc

B. Wood Doors: WI-TR-VS.

END OF SECTION

SECTION 10 11 00
VISUAL DISPLAY BOARDS

PART 1 - GENERAL

1.01 SECTION INCLUDES
A. Section Includes:
1. Porcelain enamel Markerboards
2. Tackboards

1.02 REFERENCED STANDARDS
A. American Society for Testing Materials
1. ASTM-E 84 Standard Test Method for Surface Burning Characteristics for Building Materials
2. ASTM B221Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wires, Profiles and Tubes.

1.03 SUBMITTALS
A. Shop Drawings: Provide shop drawings for each type of visual display board required.
B. Product Data: Provide technical data for materials specified. Include Material Safety Data Sheets, when applicable.
C. Samples and color charts: Provide Manufacturer's color charts and composition samples of face, core, backing and trim to illustrate finish, color and texture, where required.
D. Manufacturer’s Instructions: Provide Manufacturer’s installation instructions.

1.04 QUALITY ASSURANCE
A. Provide all items in this section as manufactured by: Claridge Products and Equipment, Inc., Harrison, Arkansas 72602-0910, Phone: 870/743-2200 Fax: 870/743-1908
B. Regulatory Requirements: Conform to applicable code for flame/smoke rating in tackboards in accordance with ASTM-E 84.
C. Operation and Maintenance: Include data on regular cleaning, stain removal, and precautions.

1.05 PROJECT CONDITIONS
A. Field measure prior to preparation of shop drawings and fabrication to ensure proper fit.
B. Comply with manufacturer’s recommendations for climatizing area for interior moisture and temperature to approximate normal occupied conditions.

1.06 DELIVERY, STORAGE AND HANDLING
A. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delay.
B. Delivery: Deliver materials in original, unopened, undamaged containers with identification labels intact.
C. Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

1.07 WARRANTY
A. Submit a "Life of the Building" warranty, stating that under normal usage and maintenance, and when installed in accordance with manufacturer's instructions and recommendations, Claridge porcelain enamel steel chalkboards and markerboards are guaranteed for the life of the building. Guarantee covers replacement of defective boards but does not include cost of removal or reinstallation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS
A. Visual display boards - chalkboards, markerboards, and tackboards - as manufactured by: Claridge Products & Equipment, Inc., Harrison, Arkansas 72602-0910; Phone: 870-743-2200; Fax: 870-743-1908

2.02 MATERIALS

A. All visual display boards shall be Series 4 factory laminated and factory framed chalkboards, markerboards or tackboards.
B. Porcelain enamel chalkboards and markerboards manufactured in accordance with the Porcelain Enamel Institute's specifications. Porcelain enamel finish shall be fired at lowest possible temperature to reduce steel and porcelain stresses and achieve superior enamel bond and hardness. Porcelain enamel writing surface to be:
    1. LCS Markerboard - use with LCS dry-erase markers
        a. Made from aluminized steel sheets - porcelain enamel surface is fusion bonded to one side of steel sheet during a single process
        b. Furnish color charts.
    2. Standard panel make-up
        a. Face Sheet: Porcelain Enamel Steel
        b. Core Material: 7/16” medium density fiberboard
        c. Backing: Moisture barrier backing
    3. Laminations: Shall be hot-type neoprene contact adhesive applied to both surfaces automatically. Each substrate to have a minimum of 80% covering with 1.5-2.0 dry mils of adhesive. Panel components shall have uniform pressure applied mechanically over entire area. Laminations shall be made by face sheet manufacturer.
    4. Sizes: Markerboard andTackboard size as shown on the drawings.
C. Tackboards: Fabricork vinyl fabric on cork underlay with 1/4" hardboard back;
D. Colors: As selected from manufacturer's standard colors. Furnish color charts.
E. Metal Trim and Accessories: Trim shall be heavy gauge extruded aluminum and shall meet or exceed ASTM B221 Alloy Standards. Finish to be etched and anodized satin finish standard. Color anodized and powder coat paint trim optional.
    1. Provide Series 4 aluminum extrusions as manufactured by Claridge Products and Equipment, Inc.
        a. Marker Tray / Chalktrough: Standard continuous, solid type aluminum chalktray with ribbed section and injection molded end closures or standard continuous hollow chalktrough with injection molded end closures.
        b. Map Rail: Standard continuous 1" map rail with cork insert and end stops at the top of each chalkboard or markerboard complete with the following accessories:
        c. Map Hooks: Provide 1 map hook for each 2 feet of map rail.

    2. Provide job assembled screw-on trim
F. Adhesive: As recommended by manufacturer.

2.03 FABRICATION

A. Shop assembly: Provide factory assembled markerboard and tackboard units, except where field assembly required.

PART 3 - EXECUTION

3.01 PROJECT CONDITIONS

A. Verify before installation that interior moisture and temperature approximate normal occupied conditions.
B. Verify that wall surfaces are prepared and ready to receive boards.

3.02 INSTALLATION

A. Deliver factory built units completely assembled in one piece without joints wherever possible. Where dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable at the factory, disassemble for delivery, and make final joints at the job site. Use H-bar at joints to maintain alignment.
B. Follow manufacturer's instructions for storage and handling of units before installation.
C. Install level and plumb, keeping perimeter trim straight in accordance with manufacturer's recommendations.

3.03 ADJUST AND CLEAN

A. Verify that all accessories are installed as required for each unit.

B. At completion, clean surfaces and trim in accordance with manufacturer's recommendations, leaving all materials ready for use.

END OF SECTION

SECTION 10 14 19

DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Dimensional characters.

a. Precast concrete dimensional characters.

1.2 ALLOWANCES

A. Allowances for are specified in Section 012100 "Allowances."

1.3 UNIT PRICES

A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."

1.4 DEFINITIONS

A. Illuminated: Illuminated by lighting source integrally constructed as part of the sign unit.

1.5 COORDINATION

A. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
3. Show message list, typestyles, graphic elements, and layout for each sign.
4. Show locations of electrical service connections.
5. Include diagrams for power, signal, and control wiring.

C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.

1. Include representative Samples of available typestyles and graphic symbols.

D. Product Schedule: For dimensional letter signs. Use same designations indicated on Drawings or specified.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer of products.

1.9 FIELD CONDITIONS

A. Field Measurements: Verify locations of electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering.
b. Separation or delamination of sheet materials and components.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Signs and supporting elements shall withstand the effects of gravity and other loads within limits and under conditions indicated.

1. Uniform Wind Load: As indicated on Drawings.
2. Concentrated Horizontal Load: As indicated on Drawings.
3. Other Design Load: As indicated on Drawings.
4. Uniform and concentrated loads need not be assumed to act concurrently.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 DIMENSIONAL CHARACTERS

A. Cast Characters: Characters with uniform faces, sharp corners, and precisely formed lines and profiles, and as follows:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. [A.R.K. Ramos]
    b. [ACE Sign Systems, Inc.]
    c. [ASI Sign Systems, Inc]
    d. [Cosco]
    e. [Gemini Signage; Gemini, Inc.]
    f. [Matthews International Corporation; Bronze Division]
    g. [Metal Arts]
    h. [Metallic Arts]
    i. [Southwell Company (The)]

2. Character Material: Cast concrete.
3. Character Height: As indicated on Drawings.
4. Thickness: As indicated on Drawings
5. Mounting: As indicated on Drawings.
6. Typeface: Arial.

2.3 DIMENSIONAL CHARACTER MATERIALS

A. Precast Concrete: See Section “03 30 00”.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Verify that electrical service is correctly sized and located to accommodate signs.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF DIMENSIONAL CHARACTERS

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.

    a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
    b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.

2. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.

    a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.
    b. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate, and install washers and nuts on stud ends projecting through opposite side of surface, and tighten.

3. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
4. Back Bar and Brackets: Remove loose debris from substrate surface and install backbar or bracket supports in position, so that signage is correctly located and aligned.
5. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
6. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 10 14 19

SECTION 10 21 13
PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Solid plastic toilet compartment dividers.

B. Urinal screens.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 – Administrative Requirements.

B. Section 06 1000 - Rough Carpentry.

C. Section 09 2116 - Gypsum Board Assemblies.

D. Section 09 3000 - Tiling.

E0. Section 12 3600 - Solid Surfacing Materials.

1.03 REFERENCES

A. Reference Standards:

1. ASTM C 834: Standard Specification for Latex Sealants.
2. ASTM C 920: Standard Specification for Elastomeric Joint Sealants.
3. ASTM D 256: Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
4. ASTM D 570: Standard Test Method for Water Absorption of Plastics.
5. ASTM D 696: Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C with a Vitreous Silica Dilatometer.
6. ASTM D 792: Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
7. ASTM D 2583: Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
8. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.
9. ASTM G 21: Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
10. ASTM G 22: Standard Practice for Determining Resistance of Plastics to Bacteria.

1.04 SUBMITTALS

A. Submit under provisions of Section 01 3000

Submittals.

B. Product Data:

1. Submit product data for each specified product. Include manufacturer's technical

data sheets and published instruction instructions.

2. Submit Material Safety Data Sheets (MSDS) for adhesives and sealants.

C. Shop Drawings:

1. Submit fully dimensioned shop drawings showing wall panel layouts, joinery, terminating conditions, substrate construction, and cutouts and holes. Include elevations, section details, and large scale details.

D. Samples:

1. Submit selection and verification samples for each color, pattern, and finish required.

E. Quality Assurance Submittals:

1. Test Reports: Submit certified test reports showing compliance with specified performance characteristics and physical properties, if required.

3. Warranty: Specimen copy of specified warranty.

F. Maintenance Data: Submit manufacturer's published maintenance manual with closeout submittals.

1.06 QUALITY ASSURANCE

A. Qualifications:

1. Fabricator Qualifications: Minimum of three years documented experience in fabricating solid surfacing wall panels similar in scope and complexity of this Project. Currently certified by the manufacturer as an acceptable fabricator.

2. Installer Qualifications: Minimum of three years documented installation experience for projects similar in scope and complexity to this Project, and currently certified by the manufacturer as an acceptable Installer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Storage and Protection: Store materials protected from exposure to harmful weather conditions, at temperature and humidity conditions recommended by manufacturer. Store sheet materials flat on pallets or similar rack-type storage to preclude damage.

1.08 PROJECT CONDITIONS

A. Field Measurements: Verify actual measurements and openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

B. Adhesive: Acclimatize adhesives to occupancy room temperatures with maximum temperature not to exceed 75 deg F.

1.09 WARRANTY

A. Manufacturer's Limited Warranty: Provide manufacturer's standard 10 Year Commercial Limited Warranty against defects in solid surface sheet materials.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Solid Plastic Toilet Compartments:
   1. Ampco Products, Inc: www.ampco.com.
   2. Metpar Corp: www.metpar.com.
   3. Scranton Products (Santana/Comtec/Capital): www.scrantonproducts.com.
   4. Substitutions: Section 01 6000 - Product Requirements.

2.02 SOLID PLASTIC TOILET COMPARTMENTS

A. Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), floor-mounted headrail-braced.
   1. Color: as selected by architect from manufacturer's standard colors..

B. Doors:
   1. Thickness: 1 inch.
   2. Width: 24 inch.
   3. Width for Handicapped Use: 36 inch, out-swinging.
   4. Height: 55 inch.

C. Panels:
   1. Thickness: 1 inch.
   2. Height: 55 inch.
   3. Depth: As indicated on drawings.

D. Pilasters:
   1. Thickness: 1 inch.
   2. Width: As required to fit space; minimum 3 inch.

E. Screens: Without doors; to match compartments; mounted to wall with two panel brackets.

2.03 ACCESSORIES

A. Pilaster Shoes: Formed chromed steel with polished finish, 3 in high, concealing floor fastenings.
   1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.

B. Head Rails: Hollow anodized aluminum, 1 x 1-1/2 inch size, with anti-grip profile and cast socket wall brackets.

C. Pilaster Brackets: Polished stainless steel.

D. Wall Brackets: Continuous type, polished stainless steel.

E. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
   1. For attaching panels and pilasters to brackets: Through-bolts and nuts; tamper proof.

F. Hardware: Polished stainless steel:
   1. Pivot hinges, gravity type, adjustable for door close positioning; two per door.
   2. Nylon bearings.
   3. Door Latch: Slide type.
   4. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.
   5. Coat hook with rubber bumper; one per compartment, mounted on door.
   6. Provide door pull for outswinging doors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify correct spacing of and between plumbing fixtures.

C. Verify correct location of built-in framing, anchorage, and bracing.

3.02 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 to 1/2 inch space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.03 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch.

B. Maximum Variation From Plumb: 1/8 inch.

3.04 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

SECTION 10 22 26
OPERABLE PARTITIONS

PART 1 **GENERAL 1.01 SECTION INCLUDES**

A. Manually operated, individual panel operable partitions, STC 56.

1.02 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified in writing by the operable partition manufacturer, as qualified to install the manufacturer's partition systems for work similar in material, design, and extent to that indicated for this Project.

B. Acoustical Performance: Test operable partitions in an independent acoustical laboratory in accordance with ASTM E90 test procedure and classified in accordance with ASTM E413 to attain no less than the STC rating specified. Provide a complete and unedited written test report by the testing laboratory upon request.

C. Preparation of the opening shall conform to the criteria set forth per ASTM E557 Standard Practice for Architectural Application and Installation of Operable Partitions.

D. The operable wall must be manufactured by a certified ISO-9001-2015 company or an equivalent quality control system.

1.03 REFERENCE STANDARDS

A. ASTM International
   1. ASTM E557 Standard Practice for Architectural Application and Installation of Operable Partitions.
   2. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
   3. ASTM E84 - Surface Burning Characteristics of Building Materials.
   4. ASTM E413 - Classification for Rating Sound Insulation

B. Health Product Declaration Collaborative
   1. Health Product Declaration Open Standard v2.1

C. International Standards Organization
   1. ISO 14021 - Environmental Labels and Declarations - Self-Declared Environmental Claims (Type II Environmental Labeling).
   2. ISO 14025:2011-10, Environmental Labels and Declarations - Type III Environmental Declarations - Principles and Procedures.
   3. ISO 14040:2009-11, Environmental Management - Life Cycle Assessment - Principles and Framework.
   4. ISO 14044:2006-10, Environmental Management - Life Cycle Assessment - Requirements and Guidelines.
   5. ISO 21930 – Sustainability in Buildings and Civil Engineering Works — Core Rules for Environmental Product Declarations of Construction Products and Services. D. ADA – Americans with Disabilities Act.

1.04 SUBMITTALS

A. Product Data: Material descriptions, construction details, finishes, installation details, and operating instructions for each type of operable partition, component, and accessory specified.

B. Shop Drawings: Show location and extent of operable partitions. Include plans, elevations, sections, details, attachments to other construction, and accessories. Indicate dimensions, weights, conditions at openings, and at storage areas, and required installation, storage, and operating clearances. Indicate location and installation requirements for hardware and track, including floor tolerances required and direction of travel. Indicate blocking to be provided by others.

C. Setting Drawings: Show imbedded items and cutouts required in other work, including support beam punching template.

D. Samples: Color samples demonstrating full range of finishes available by architect. Verification samples will be available in same thickness and material indicated for the work.

E. Reports: Provide a complete and unedited written sound test report indicating glass thickness and spacing in test specimen matches product as submitted.

F. Create spaces that are healthy for occupants.

1. Furnish products and materials with Health Product Declaration (HPD), Manufacturer Inventory, or other material health disclosure documentation. Products without an HPD or other disclosure documentation are not acceptable.

G. Furnish materials that generate the least amount of pollution.

1. Furnish products and materials that have third party verified environmental product declarations (EPD's). Consider products and materials that have optimized environmental performance (reduced life cycle impacts). Products without an EPD or other disclosure documentation are not acceptable.

H. Buy American: Operable partition to be manufactured in the United States in compliance with applicable U.S. Federal Trade Commission (FTC) and U.S. Customs Service and Border Protections regulations and be labeled "Made in America".

1.05 DELIVERY, STORAGE, AND HANDLING

A. Clearly mark packages and panels with numbering systems used on Shop Drawings. Do not use permanent markings on panels. B. Protect panels during delivery, storage, and handling to comply with manufacturer's direction and as required to prevent damage.

1.06 WARRANTY

A. Provide written warranty by manufacturer of operable partitions agreeing to repair or replace any components with manufacturing defects.

B. Warranty period: Three (3) years.

PART 2 – PRODUCTS 2.01 MANUFACTURERS, PRODUCTS, AND OPERATION

A. Basis of Design Manufacturers: Modernfold, Inc.,
215 West New Road
Greenfield, IN 46140
Toll Free: 800.869.9685
email: info@modernfold.com www.modernfold.com

B. Basis of Design Product:Acousti-Seal Encore™ – Single Panel: Manually operated individual panel operable partition.

2.02 OPERATION

A. Acousti-Seal Encore™ – Single Panel: Series of individual flat panels, manually operated, top supported with operable floor seals and automatic top seals. B. Final Closure:

1. Horizontally expanding panel edge with removable crank.

2.03 PANEL CONSTRUCTION

A. Nominal 4-1/4-inch (108 mm) thick panels in manufacturer's standard 51-inch (1295 mm) widths. All panel horizontal and vertical framing members fabricated from minimum 16-gage formed steel with overlapped and welded corners for rigidity. Top channel is reinforced to support suspension system components. Frame is designed so that full vertical edges of panels are of formed steel and provide concealed protection of the edges of the panel skin.

B. Panel Skin Options:

1. Roll-formed steel wrapping around panel edge. Panel skins shall be lock formed and welded directly to the frame for unitized construction. Acoustical ratings of panels with this construction (select one):

C.56 STC - 16-gage steel

D. Panel Trim: No vertical or horizontal trim required or allowed on edges of panels; minimal groove appearance at panel joints.
E. Panel Weight: Steel Skin, 11.9 lbs./square foot.

2.04 PANEL FINISHES

A. Panel face finish shall be reinforced heavy-duty vinyl with woven backing weighing not less than 30 ounces (850 g) per lineal yard.
B. Panel trim: No exposed panel trim required or allowed; seals and hardware to be of one color-Black.

2.05 SOUND SEALS

A. Vertical Interlocking Sound Seals between panels: Roll-formed steel astragals, with tongue and groove configuration in each panel edge. Rigid plastic or aluminum astragals are not acceptable.
B. Horizontal Top Seals shall be Modernfold SureSet™ automatic operable top seals, manually operated operable top seals not required or permitted.
C. Horizontal Bottom Seals shall be Modernfold SureSet™ bottom seal:
    1. Manually activated seals providing nominal 2-inch (51 mm) operating clearance with an operating range of +1/2-inch (13 mm) to –1-1/2-inch (38 mm). Seal shall be operable from panel edge or face. Extended seal shall exert nominal 120 pounds (54 kg) downward force to the floor throughout operating range.

2.06 SUSPENSION SYSTEM

A.#14 Suspension System - Smart Track™
    1. Suspension Tracks: Minimum 7-gage, 0.18-inch (4.57 mm) roll formed steel. Track shall be supported by adjustable steel hanger brackets connected to structural support pairs of 1/2-inch (13 mm) diameter threaded rods. Brackets must support the load bearing surface of the track.
        a. Exposed track soffit: Steel, removable for service and maintenance, attached to track bracket without exposed fasteners, and pre-painted off-white.
    2. Carriers: Two all-steel trolleys with steel-tired ball bearing wheels. Non-steel tires are not acceptable. Suspension system shall provide automatic indexing of panels into stack area using preprogrammed switches and trolleys without electrical, pneumatic, or mechanical activation.
    3. Warranty period: Twenty (20) years.

PART 3 – EXECUTION

3.01 INSTALLATION A. General: Comply with ASTM E557, operable partition manufacturer's written installation instructions, Drawings and approved Shop Drawings.
B. Install operable partitions and accessories after other finishing operations, including painting have been completed.
C. Match operable partitions by installing panels from marked packages in numbered sequence indicated on Shop Drawings.
D. Broken, cracked, chipped, deformed or unmatched panels are not acceptable.

3.02 CLEANING AND PROTECTION

A. Clean partition surfaces upon completing installation of operable partitions to remove dust, dirt, adhesives, and other foreign materials according to manufacturer's written instructions.
B. Provide final protection and maintain conditions in a manner acceptable to the manufacturer and installer that ensure operable partitions are without damage or deterioration at time of Substantial Completion.

3.03 ADJUSTING

A. Adjust operable partitions to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and other moving parts.

3.04 EXAMINATION

A. Examine flooring, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable partitions. Proceed with installation only after unsatisfactory conditions have been corrected.

3.05 DEMONSTRATION

A. Demonstrate proper operation and maintenance procedures to Owner's representative.

B. Provide Operation and Maintenance Manual to Owner's representative.

END OF SECTION

SECTION 10 26 00
WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Corner guards.

1.02 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each impact-resistant wall protection unit. Include sections, details, and attachments to other work.
   1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
   1. Corner Guards: 12 inches long. Include examples of joinery, corners, and field splices.

1.03 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each impact-resistant plastic material, from manufacturer.

B. Material Test Reports: For each impact-resistant plastic material.

C. Warranty: Sample of special warranty.

1.04 CLOSEOUT SUBMITTALS

A. Maintenance data. For each impact-resistant wall protection unit to include in maintenance manuals.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain impact-resistant wall protection units from single source from single manufacturer.

C. Surface-Burning Characteristics: As determined by testing identical products per ASTM E 84, NFPA 255, or UL 723 by UL or another qualified testing agency.

D. Regulatory Requirements: Comply with applicable provisions in ICC/ANSI A117.1.

E. Preinstallation Conference: Conduct conference at Project site.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store impact-resistant wall protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
   1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
   2. Keep plastic sheet material out of direct sunlight.
   3. Store plastic wall protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.
      a. Store corner-guard covers in a vertical position.

1.07 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of impact-resistant wall protection units that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures.

b. Deterioration of plastic and other materials beyond normal use.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MATERIALS

A. Polycarbonate Plastic Sheet: ASTM D 6098, S-PC01, Class 1 or 2, abrasion resistant; with a minimum impact-resistance rating of 15 ft-lbf/in. of notch when tested according to ASTM D 256, Test Method A.

B. Stainless-Steel Sheet: ASTM A 240/A 240M.

C. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.

2.02 CORNER GUARDS

A. Surface-Mounted, Resilient, Plastic Corner Guards: Assembly consisting of snap-on plastic cover installed over continuous retainer; including mounting hardware; fabricated with 90- or 135-degree turn to match wall condition.

1. Basis-of-Design Product: (CG1) C/S Group, flush mount, FS-20N, (CG2) Fry Reglet, Corner Trim, DC1 or comparable product by one of the following:
   a. Arden Architectural Specialties, Inc.
   b. IPC Door and Wall Protection Systems; Division of InPro Corporation.
   c. Korogard Wall Protection Systems; a division of RJF International Corporation.
   d. Pawling Corp.
   e. WallGuard.com.
2. Cover: Extruded rigid plastic, minimum 0.078-inch wall thickness; as follows:
   a. Profile: Nominal 2-inch- long leg and 1/4-inch corner radius.
   b. Height: Extend from top of wall base to 8’-0” above finished floor.
   c. Color and Texture: As indicated on the Drawing “FINISH LEGEND,” or if not indicated, as selected by Architect from manufacturer's full range.
3. Retainer: Minimum 0.060-inch- thick, one-piece, extruded aluminum.
4. Top and Bottom Caps: Prefabricated, injection-molded plastic; color matching cover; field adjustable for close alignment with snap-on cover.
5. Locations: Provide at all exterior corners of gypsum board and metal stud walls and partitions that are not indicated to have porcelain or ceramic tile.

2.03 FABRICATION

A. Fabricate impact-resistant wall protection units to comply with requirements indicated for design, dimensions, and member sizes, including thicknesses of components.

B. Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.

C. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.

B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.03 INSTALLATION

A. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
   1. Install impact-resistant wall protection units in locations and at mounting heights indicated on Drawings.
   2. Provide splices, mounting hardware, anchors, and other accessories required for a complete installation.
      a. Provide anchoring devices to withstand imposed loads.

B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

3.04 CLEANING

A. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent.

END OF SECTION

Section 10 28 00
Toilet Room Accessories

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes surface and recessed mounted toilet room accessories indicated.
B. Related Sections: Coordinate work of this Section with work of other sections, including Division-1 Sections as required to properly execute the work and as necessary to maintain satisfactory progress of the work.

1.03 SUBMITTALS

A. Product Data: Provide product data for each toilet accessory item specified, including details of construction relative to materials, dimensions, gauges, profiles, method of mounting, specified options, and finishes. Provide manufacturer's installation instructions, and service and parts manuals.
B. Schedule: Indicating types, quantities, sizes, and installation locations (by room) for each toilet and bath accessory item to be provided for the Project.
C. Samples:
   1. Upon request, submit one sample of each item specified. If more than one manufacturer is specified, submit one sample of each item for Architect’s review.
D. Setting Drawings: Where cutouts are required in other work, provide substrate preparation instructions, and directions for preparing cutouts and for installation of anchorage devices.

1.04 WORK INCLUDED

A. Toilet Room Accessories

1.05 REFERENCES

A. ANSI A117, Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.

1.06 QUALITY ASSURANCE

A. This Section outlines only minimum standards and requirements. Refer to the Drawings, and other specification sections for additional requirements. Bring all conflicts and discrepancies to the attention of the Architect and do not start work until such conflicts and discrepancies are clarified and corrected.
B. Single Source: Accessories shall be the product of a single manufacturer.

C. Accessories with tumbler locks shall be keyed alike.

D. Regulatory Requirements: ADA compliant accessories shall comply with Arkansas Accessibility Code 2017 (AAC-2017)

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver items in manufacturer's original, unopened, protective packaging.
B. Store materials in original, protective packaging to prevent physical damage or wetting.

C. Handle so as to prevent damage to accessories.

1.08 WARRANTY

A. Furnish one (1) year guarantee against defects in materials and workmanship on all accessories. In addition to the above the following shall apply:
   1. Mirrors shall have a 15 year guarantee against silver spoilage.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, provide toilet room accessories manufactured by one (1) of the following, or Architect approved equal. Other manufacturers must have a minimum of five (5) years experience manufacturing product meeting or exceeding the specifications and comply with Division-1 Section "Product Substitution Procedures" for requirements regarding substitutions to be considered.
   1. American Specialties, Inc.
   2. Bobrick Washroom Equipment, Inc.
   3. Bradley Corp.

2.02 TOILET ROOM ACCESSORY SCHEDULE

A. General: Provide the following toilet and bath accessories in the locations indicated on the Drawings.

2.03 MATERIALS

A. Stainless Steel:
   1. Alloy: AISI, Type 302 or 304 (18-8) ASTM A167.
   2. Finish: No. 4 satin, unless indicated or directed otherwise.
   3. Thickness: As indicated with 22 US Stainless gauge minimum.
B. Aluminum:
   1. Extruded: 6463-T5 alloy, anodized.
   2. Cast: 356 or 356-T6 alloy.
C. Chromium Plating:
   1. Method: Over nickel.
   2. Standard: ASTM C456, Type SC 2.

D. Brass:

   1. Cast or forged.
   2. QQ-B-626C.

E. Mirrors (Stainless Steel Framed):
   1. Standard: FS DD-G-451-C, silvering quality No. 1 tempered float glass.

2. Thickness: 1/4 inch.
3. Backing: Electrolytic copper.
4. Protection: Padding and filler strips.

F. All tumbler locks to be fastened to accessories with lock nuts. Fastening locks to units with spring clips is not acceptable.

G. Fasteners: Concealed type recommended by manufacturer to suit application. Tamper proof.

H. Other Materials: Provide other materials, not specifically described, but required for a complete and proper installation.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Check wall opening for dimensions, plumbness of blocking or frames that would affect installation of recessed accessories. For surface mounted accessories check condition of wall and confirm installation of blocking within wall.

B. Verify spacing of plumbing fixtures that affect installation of toilet room accessories.

3.02 INSTALLATION

A. Install accessories at locations and heights indicated, straight, plumb and level and in accordance with manufacturer’s installation instructions.

B. Install items with non-corrosive anchoring devices.

C. Installation methods shall conform to manufacturer's recommendations for blocking and proper support.

D. Conceal evidence of drilling, cutting, and fitting to room finish.

E. Fit flanges of accessories snugly to wall surfaces.

3.03 ADJUSTMENT AND CLEANING

A. Upon completion of the work, or when directed, remove all traces of protective coatings or paper.

B. Adjust accessories for proper operation. Test mechanisms, hinges, locks and latches and where necessary adjust and lubricate.

C. Clean and polish exposed surfaces prior to final installation.

D. Deliver accessories schedule, keys, and parts manual as part of project closeout documents. For Owner’s permanent records, provide two (2) sets of the following items of manufacturer’s literature at Project Close-Out:
1. Technical data sheet of each item used for the Project.
2. Service and parts manuals.
3. Name of local representative to be contacted in the event of need of field service or consultation.

END OF SECTION 10 2800

Section 10 44 00
Fire Protection Specialties

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers where indicated.

B. Related Sections: Coordinate work of this Section with work of other sections, including Division-1 Sections as required to properly execute the work and as necessary to maintain satisfactory progress of the work.

1.03 QUALITY ASSURANCE

A. This Section outlines only minimum standards and requirements. Refer to the Drawings, and other specification sections for additional requirements. Bring all conflicts and discrepancies to the attention of the Architect and do not start work until such conflicts and discrepancies are clarified and corrected.

B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Standard for Portable Fire Extinguishers".

C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

D. Provide portable fire extinguishers by one manufacturer, unless otherwise acceptable to Architect.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Operation and maintenance data.

C. Warranty: Sample of special warranty.

1.05 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Failure of hydrostatic test according to NFPA 10.
   b. Faulty operation of valves or release levers.

2. Warranty Period: Six (6) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: J.L. Industries, or one (1) of the following, or Architect approved equal. Other manufacturers must have a minimum of five (5) years experience manufacturing product meeting or exceeding the specifications and comply with Division-1 Section "Product Substitution Procedures" for requirements regarding substitutions to be considered.

1. Amerex Corporation
2. Ansul Incorporated; Tyco International Ltd.
3. Badger Fire Protection; a Kidde company
4. Buckeye Fire Equipment Company
5. Larsen's Manufacturing Co.
6. Potter-Roemer, Inc.

2.02 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Provide Dry Chemical fire extinguishers as follows:

1. Rating: UL rated 4A-80BC for Class A, B, C, K fires.
2. Capacity: 10 lb. nominal capacity
3. Finish: Red enameled steel container
4. Number/Location: As indicated on Drawings.
5. Approved Product: J.L. Industries "Cosmic 10E", or Architect approved equal in accordance with Paragraph 2.1.

B. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.

2.03 MOUNTING BRACKETS

A. Provide manufacturer's standard steel bracket designed to prevent accidental dislodgement of extinguisher, of proper size for type and capacity of extinguisher indicated, in manufacturer's standard plated finish.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
   a. Orientation: Vertical or horizontal as indicated on Drawings or as directed by Architect.

2.04 CABINETS

A. JL Industries Semi Recessed model 1037 Stainless Steel Cabinet W/ 10 lb galaxy Extinguisher.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine walls and partitions for suitable blocking where fire extinguisher brackets will be installed.

B. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at location and heights indicated or in compliance with requirements of authorities having jurisdiction.

END OF SECTION 10 4400

SECTION 10 73 16
METAL CANOPIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Freestanding, pre-engineered metal canopies including concrete foundation, steel framing, metal roof, roof drains and leaders, fascia components, and accessories.

1.02 RELATED SECTIONS

A. Section 03 3000 - Cast-In-Place Concrete: Concrete islands and curbing.

B. Section 05 5000 - Metal Fabrications.

C. Section 07 9200 - Joint Sealers.

D. Division 22 - Plumbing: Plumbing services and connections.

1.03 REFERENCES

A. American Institute of Steel Construction, Inc. (AISC): AISC 360 - Specification for Structural Steel Buildings (copyrighted by AISC, ANSI approved).

B. American Society of Civil Engineers (ASCE): ASCE 7 - Minimum Design Loads for Buildings and Other Structures (copyrighted by ASCE, ANSI approved).

C. American Welding Society (AWS): AWS D1.1 - Structural Welding Code - Steel (copyrighted by AWS, ANSI approved).

D. ASTM International (ASTM):
   1. ASTM A36 - Standard Specification for Structural Steel.
   2. ASTM A992 - Standard Specification for Structural Steel Shapes.
   3. ASTM A 307 - Standard Specification for Carbon Steel Bolts and Studs 60,000 psi Tensile Strength
   4. ASTM A 325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
   5.. ASTM A 500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
   6. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   7. ASTM C 1107 - Standard Specification for Packaged Dry, Hydraulic- Cement Grout (Non-Shrink).

E. National Association of Architectural Metal Manufacturers (NAAMM): NAAMM MFM - Metal Finishes Manual

F. National Fire Protection Association (NFPA): NFPA 70 - National Electrical Code (copyrighted by NFPA, ANSI approved) - hereinafter referred to as NEC.

1.04 PERFORMANCE REQUIREMENTS

A. Canopy Design: As indicated on drawings.

B. Structural Performance: Provide pre-engineered canopies capable of withstanding the effects of

gravity loads and the following loads and stresses within limits and under conditions indicated for the specific location where Canopy will be installed:

1. Uniform pressure as indicated on drawings - minimum design snow, wind and seismic loads per ASCE 7-05.

C. Thermal Movements: Provide pre-engineered canopies that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range):120° F, ambient; 180° F, material surfaces.

1.05 SUBMITTALS

A. General: Submit under provisions of Section 01 3000 – Administrative Requirements.

B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
   1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods.

C. Shop Drawings: Submit shop drawings. Include plans, elevations, sections, details, and attachments to other work. Canopy supplier shall furnish complete canopy drawings signed and sealed by a professional engineer licensed in the State of Tennessee.

D. Samples: Submit samples for initial color selection. Submit samples of each specified finish. Submit samples in form of manufacturer's color charts showing full range of colors and finishes available. Where finishes involve normal color variations, include samples showing the full, range of variations expected.

E. Certificates: Submit product certificates signed by the manufacturer certifying material compliance with specified performance characteristics and criteria, and physical requirements.

F. Warranty Data: Submit warranty documents specified herein.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in engineering and manufacturing pre-engineered canopies with a minimum documented experience of ten (10) years and with a quality assurance program utilizing a quality inspection for each system.

B. Welding: Qualify procedures and personnel according to the following:
   1. Welding shall be in accordance with AWS D1.1 (with E70XX electrodes). Structural shop welding shall be done by certified welders.
   2. Steel shop connections shall be welded and field connections shall be bolted (unless otherwise noted on the Drawings). Shop welds may be changed to field welds with the approval of the project engineer.
   3. Slag shall be cleaned from welds and inspected. Steel shall be painted with red oxide rust-inhibitive primer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for

intended use.

D. Source Limitations: Obtain pre-engineered metal canopy through one source from a single manufacturer who shall manufacture and install the canopy.

E. Product Options: The Drawings indicate size, profiles, and dimensional requirements of pre-engineered metal canopies and are based on the specific system indicated. Refer to Refer to Section 01 3000 – Administrative Requirements. Do not modify intended aesthetic effects, as judged solely by the Architect, except with the Architect's approval. If modifications are proposed, submit comprehensive explanatory data to the Architect for review.

F. Coordination:
1. The Contractor shall conduct site meetings to verify project requirements, substrate conditions, utility connections, manufacturer's drawings and installation instructions. Comply with Division 1 section on project meetings. Refer to contract drawings for additional information regarding removal of foundation obstructions prior to mobilization of canopy installer.
2. The contractor shall prepare for and pour the concrete footers for the pre-engineered metal canopies. Manufacturer shall furnish
recommended footing drawings as per IBC Section 1807.3 and prints
and rebar details for concrete footings, as well as provide anchor bolts to be embedded in concrete footer. Such items shall be delivered to project site in time for installation.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Protect components and accessories from corrosion, deformation, damage, and deterioration when stored at job site. Keep materials free from dirt and foreign matter.

1.08 PROJECT CONDITIONS

A. Field Measurements: The Contractor shall verify location and elevation of footings relative to finished grade, columns, and other construction contiguous with pre-engineered metal canopies by field measurements before fabrication and indicate measurements on shop drawings.

1.09 WARRANTY

A. Canopy manufacturer shall warrant the products it manufactures to be free of defects in materials, leaks, and workmanship for 1 year from date of shipment.
1. Canopy manufacturer shall offer a 20-year limited warrantee against peeling, flaking, chipping of canopy deck when properly maintained,
and pass on manufacturer's warrantees for accessory items.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers:
1. Austin Mohawk and Company, Inc.
2l75 Beechgrove Place
Utica, NY 13501
Toll Free Tel: 800-765-3110
Tel: 3l5-793-3000;
Email: request info (info@austinmohawk.com)
Web:www.austinmohawk.com

2. Madison Industries Inc.
   1900 East 64th Street
   Los Angeles, CA 9001
   Phone: (323) 583-4061
   FAX: (323) 582-1015
   Web: www.madisonind.com

3. Lane Supply, Inc.
   120 Fairview
   Arlington, TX 76010
   Phone: 817-261-9116
   Fax:817-275-1660
   Web:www.lanesupplyinc.com

B. Substitutions: Requests for substitutions will be considered in accordance with provisions of Section 01 3000 – Administrative Requirements.

2.02 MATERIALS

A. Structural Steel:
   1. Material and work shall conform to the latest AISC 360.
   2. Wide flange I-beam shall conform to ASTM A992 GR.50, Fy = 50 ksi. Other rolled sections shall conform to ASTM A36, Fy = 36 ksi.
   3. Square and rectangular tubing shall conform to ASTM A500, Grade B, Fy = 46 ksi.
   4. Plate steel shall conform to ASTM A36, Fy = 36 ksi.
   5. Structural steel shall be painted with a rust inhibitive (red oxide) primer(std).

B. Sheet Metal:
   1. Decking: 3 inch by 16 inch by 20 gage smooth white, ASTM A 653 GR40, Fy = 40 ksi, galvanized steel with baked enamel finish.
   2. Center and Tapered Gutter: 24 gage hot-dip galvanized steel baked enamel finish.
   3. Perimeter Gutter: 20 gage hot-dip galvanized steel baked enamel finish.
   4. Internal Downspout: 3 inch diameter PVC.
   5. External Downspouts: 3 inch by 4 inch by 24 gage hot-dip galvanized steel with baked enamel finish.
   6. Manufacturer shall be capable of providing seamless gutter profiles up to 40 feet in length

2.03 PRE-ENGINEERED METAL CANOPY

A. General: Provide a complete, integrated set of manufacturer's standard design canopy components using a flexible frame with fixed base wherein the steel framing system uses stacked I Beam construction transferring the moment to the concrete footing without requiring a rigid connection between steel frame members. The beam arrangements allow for a cantilever design which can bring the columns from the perimeter of the structure to the inner protected zones between the drive lanes. These mutually dependent components form a pre-engineered canopy, ready for construction on project site. Said pre-engineered metal canopy will be designed to meet all site structural wind, snow and seismic requirements.

B. Canopy Fascia: Aluminum Composite Panel (ACM): Available with a fluorocarbon paint finish, masked on one side. Shall be warranted for 10 or 20 years depending on color and finish.

C. Canopy Finishes: Comply with NAAMM MFM for recommendations for applying and designating

finishes.

1. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.

D. Fabrication: Fabricate pre-engineered canopies completely in factory.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which the work is to be installed, and notify the Contractor in writing, with a copy to the Owner and the Architect, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.
   1. Examine supporting foundations for compliance with manufacturer's requirements, including installation tolerances and other conditions affecting performance of supporting members.
   2. Check installed anchor bolts for accuracy. Verify that bearing surfaces are ready to receive the work.
   3. Verify the rough-in of required mechanical and electrical services prior to placement of the structure.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. A work area shall be required extending 10 feet beyond buildings and canopies in all directions to the extent practical. The work area shall be flat, comprised of hard-packed soil or gravel, asphalt, or concrete, and free of open excavation, debris, construction equipment and construction workers. An additional flat work space a minimum of 25 feet by 25 feet or as practical shall be provided adjacent to the canopy and/or building for unloading and storing materials. Site to meet OSHA guidelines to allow lift equipment and scaffolding to maneuver the work area.

B. Set pre-engineered metal canopy plumb and aligned. Level base plates true to plane with full bearing on concrete bases.

C. Fasten pre-engineered metal canopy columns to anchor bolts and/or foundation bolts.

D. Provide anchor bolts as follows:
   1. Anchor bolts or foundation bolts will be set by the Owner in accordance with approved site specific drawings. They must not vary from the size and dimensions shown on the erection drawings. Use of a plywood template is recommended. Remove template prior to column erection.
   2. Anchor bolts shall conform to ASTM A 307, and shall have a minimum of 7 inches of exposed thread and 23 inch minimum embedment with
      1-1/4 inch nut and washer as embedment end.

3. Shrinkage-resistant grout shall be ASTM C 1107, factory-packaged, aggregate grout, non-corrosive, non-staining, mixed with water to consistency suitable for application and a 30 minute working time installed by the Contractor.

E. Provide bolted connections as follows:
   1. Structural erection bolts shall conform to ASTM A 325.
   2. A minimum diameter of 3/4 inch erection bolts shall be used for cross beam-to-column connections and a minimum of 5/8 inch diameter bolts for all other connections.
   3. Drilled holes in structural steel shall be deburred.
   4. Flat structural washers (minimum of one) shall be used on bolted connections.
   5. Bolts shall be tightened to snug tight per latest RCSC specifications (unless otherwise specified).

F. Provide screws as follows:
   1. Fastening shall be performed per installation prints provided by the manufacturer.
   2. Installation screws shall be furnished with electrode deposited cadmium coating unless otherwise noted.
   3. Self-drilling and self-tapping screws shall have a sufficient cut point and a 1/2 inch outside diameter dished metal-backed neoprene washer to be used in water sealing applications .

G. Provide pedestrian protection and warnings during construction which comply with local, Federal, and OSHA codes.

H. Prior to steel erection of any kind, the Contractor shall grade, backfill and otherwise prepare the job site to allow for rolling scaffold and ensure safe working conditions including the removal or relocation of overhead power lines.

I. Any grade or elevation situations which deviate from the approved manufacturer's plans shall be conveyed to the manufacturer prior to fabrication.

J. All anchor bolts and/or leveling plates shall be set within 1/4 inch tolerance on layout and grade level.

K. Temporary electrical power shall be provided.

L. Dumpster for trash and debris shall be provided by the Contractor.

3.04 ADJUSTING AND CLEANING

A. After completing installation, inspect exposed finishes and repair damaged finishes.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair, or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 10 75 29

PLAZA-MOUNTED FLAGPOLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes plaza-mounted flagpoles made from stainless steel.

B. Owner-Furnished Material: Flags.

C. Related Requirements:

1. Section 264113 "Lightning Protection for Structures" for connecting plaza-mounted metal flagpoles to lightning protection system.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for flagpoles.

B. Shop Drawings: For each flagpole.

1. Include the following:

a. Plans, elevations, details, and attachments to other work. Show general arrangement, jointing, fittings, accessories, grounding, anchoring, and support.
b. Details of plaza-mounted connections and mountings, including setting drawings, templates and directions for installing anchorages that are to be embedded in concrete or masonry.

C. Samples for Verification: For each type of exposed finish, in manufacturer's standard sizes.

D. Delegated Design Submittals: For flagpoles.

1. Include loads, point reactions, and locations for attachment of flagpoles to building's structure.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain flagpoles as complete units, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design flagpole assemblies.

B. Seismic Performance: Flagpole assemblies to withstand the effects of earthquake motions determined according to ASCE/SEI 7.

C. Structural Performance: Flagpole assemblies, including anchorages and supports, to withstand design loads indicated within limits and under conditions indicated.

1. Wind Loads: Determine according to NAAMM FP 1001. Basic wind speed for Project location is 120.
2. Base flagpole design on nylon or cotton flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.

2.3 ALUMINUM FLAGPOLES

A. Exposed Height: 35 feet.

B. Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:

1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.
2. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.

C. Cast-Metal Shoe Base: Made from aluminum with same finish and color as flagpoles for anchor-bolt mounting; furnish with anchor bolts.

1. Furnish connector to building's lightning protection system conductor.

D. Hinged Baseplate: Cast-metal tilting hinged base and anchor plate joined by permanently secured pivot rod. Furnish with stainless steel screws for securing tilting base to anchor plate when not tilted; furnish with anchor bolts.

1. Finish: Same as flagpole.
2. Furnish aluminum base or aluminum flashing collar finished to match flagpole.
3. Furnish connector to building's lightning protection system conductor.

E. Pivoting Tilt Base: Steel baseplate with channel or rectangular tube uprights, pivot bolt, and locking device for tilting flagpole. Furnish tilting flagpole with steel counterweight box and weights, or furnish with internal counterweight. Furnish base with anchor bolts.

1. Finish: Same as flagpole.
2. Furnish connector to building's lightning protection system conductor.

2.4 COPPER-ALLOY (BRONZE) FLAGPOLES

A. Exposed Height: 35 feet.

B. Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:

1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.
2. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.

C. Cast-Metal Shoe Base: Made from steel with finish matching flagpole for anchor-bolt mounting; furnish with anchor bolts.

1. Furnish connector to building's lightning protection system conductor.

2.5 STAINLESS STEEL FLAGPOLES

A. Exposed Height: 35 feet.

B. Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:

1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.
2. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.

C. Cast-Metal Shoe Base: Made from steel with finish matching flagpole for anchor-bolt mounting; furnish with anchor bolts.

1. Furnish connector to building's lightning protection system conductor.

2.6 STEEL FLAGPOLES

A. Exposed Height: 30 feet.

B. Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:

1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.
2. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.
3. Provide self-aligning, snug-fitting joints.

C. Cast-Metal Shoe Base: Made from steel with finish matching flagpole for anchor-bolt mounting; furnish with anchor bolts.

1. Furnish connector to building's lightning protection system conductor.

2.7 FIBERGLASS FLAGPOLES

A. Exposed Height: 35 feet.

B. Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:

1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.
2. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.

C. Cast-Metal Shoe Base: Made from aluminum with finish matching flagpole for anchor-bolt mounting; furnish with anchor bolts.

1. Furnish connector to building's lightning protection system conductor.

D. Hinged Baseplate: Cast-metal tilting hinged base and anchor plate joined by permanently secured pivot rod. Furnish with stainless steel screws for securing tilting base to anchor plate when not tilted; furnish with anchor bolts.

1. Finish: Same as flagpole.
2. Furnish aluminum base or aluminum flashing collar finished to match flagpole.
3. Furnish connector to building's lightning protection system conductor.

2.8 FITTINGS

A. Finial Ball: Flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.

1. **0.063-inch** spun aluminum[**, finished to match flagpole**][**with gold anodic finish**].
2. **20-oz.** copper with 23-karat gold-leaf finish.
3. Spun stainless steel, finished to match flagpole.
4. Spun copper alloy, finished to match flagpole.

B. Finial Eagle: Sized [**as indicated**][**as standard with manufacturer for flagpole size indicated**]<**Insert size**>.

1. Cast aluminum[**, finished to match flagpole**][**with gold anodic finish**].
2. **20-oz.** copper with 23-karat gold-leaf finish.

C. Internal Halyard, Winch System: Manually operated winch with control-stop device and removable handle, stainless steel cable halyard, and concealed revolving truck assembly with plastic-coated counterweight and sling. Furnish flush access door secured with cylinder lock. Finish truck assembly to match flagpole.

1. Halyard Flag Snaps: [**Chromium-plated bronze**][**Stainless steel**][**Bronze**][**Nylon**] swivel snap hooks[**with neoprene or vinyl covers**]. Furnish two per halyard.

D. Internal Halyard, Cam Cleat System**: 5/16-inch- diameter, braided polypropylene** halyard; cam cleat; and concealed revolving truck assembly with plastic-coated counterweight and sling. Furnish flush access door secured with cylinder lock. Finish truck assembly to match flagpole.

1. Halyard Flag Snaps: Stainless steel swivel snap hooks with neoprene or vinyl covers. Furnish two per halyard.

E. External Halyard: Ball-bearing, nonfouling, revolving truck assembly of cast metal with continuous 5/16-inch- diameter, braided polypropylene halyard and 9-inch cast-metal cleats with fasteners. Finish exposed metal surfaces to match flagpole.

1. Halyards and Cleats: Two at each flagpole.
2. Cleat Covers: Cast metal, finished to match flagpole, secured with cylinder locks.
3. Halyard Covers: 2-inch channel, 60 inches long, finished to match flagpole.
4. Halyard Flag Snaps: Stainless steel swivel snap hooks with neoprene or vinyl covers. Furnish two per halyard.

2.9 MISCELLANEOUS MATERIALS

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M.

B. Elastomeric Joint Sealant: Multicomponent nonsag urethane joint sealant complying with requirements in Section 079200 "Joint Sealants."

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.10 ALUMINUM FINISHES

A. Natural Satin Finish: AA-M32, fine, directional, medium satin polish; buff complying with AA-M20; seal aluminum surfaces with clear, hard-coat wax.

B. Clear Anodic Finish: AAMA 611, **AA-M12C22A41**.

C. Color Anodic Finish: AAMA 611, **AA-M12C22A42/A44**.

1. Color: As selected by Architect from manufacturer's full range.
2. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Gold Anodic Finish: AAMA 611, AA-M32C22A43; gold color.

E. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of **1.5 mils**. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

F. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2604 and containing not less than [**50**][**70**] percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

2.11 COPPER-ALLOY FINISHES

A. Hand-Rubbed Finish, Lacquered: Directionally textured, fine satin, mechanical finish coated with lacquer specified for copper alloys, applied by air spray in two coats per manufacturer's written instructions, with interim drying, to a total thickness of **1 mil**.

B. Statuary Conversion Coating over Satin Finish: Directionally textured, fine satin, mechanical finish with sulfide conversion coating.

1. Color: Match Architect's sample.
2. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.12 STAINLESS STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
2. Directional Satin Finish: No. 4.

2.13 STEEL FINISHES

A. Flagpole Interior Finish: Apply one coat of bituminous paint on interior of flagpole.

B. Galvanized Finish: Hot-dip galvanize after fabrication to comply with ASTM A123/A123M.

C. Polyurethane Enamel Finish: Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning". After cleaning, apply manufacturer's standard primer and two-coat, high-gloss, high-build, polyurethane-enamel finish.

1. Color: **As selected by Architect from manufacturer's full range**.

D. Baked-Enamel or Powder-Coat Finish: Remove mill scale and rust, if present, from uncoated steel, complying with **SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning"**. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of **2 mils**.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

2.14 FIBERGLASS FINISHES

A. Fiberglass: UV-light stable, hard, high-gloss gel coat or high-gloss, high-build polyurethane or polyester coating.

1. Color: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FLAGPOLE INSTALLATION

A. General: Install flagpoles where indicated and according to Shop Drawings and manufacturer's written instructions.

B. Baseplate: Install baseplate on washers placed over leveling nuts on bolts and adjust until flagpole is plumb. After flagpole is plumb, tighten retaining nuts and fill space under baseplate solidly with nonshrink, nonmetallic grout. Finish exposed grout surfaces smooth and slope 45 degrees away from edges of baseplate.

C. Mounting Brackets and Bases: Anchor brackets and bases securely to structural support with fasteners as indicated on Shop Drawings.

END OF SECTION

SECTION 11 53 13
BMC/FUME HODE SPECIFICATION

1.01 GENERAL:

A. Fume hoods shall be of a "picture frame" airfoil design and construction. Each fume hood superstructure shall provide for safe efficient removal of all fumes, both heavy and light, with the least amount of turbulence as the air enters the hood.

B. Standard airfoil bench hood superstructures shall be tested in accordance with the ASHRAE 110-1995 Test Procedure and perform well within the American Conference of Governmental Industrial Hygienists recommendations.

1.02 MATERIAL:

A. Metal: Prime furniture steel, free of scales, buckles, or other defects; ASTM A366.

B. Stainless Steel: Type 304 or 316, as noted, commercial grade, No. 4 Finish, ASTM A167.

C. Safety Glass: 1/4" Laminated; conforming to ANSI 297.1 for 400-foot-pound impact, and to CPSC 16 CFR 1201 for Category II Safety Glazing.

D. PVC: Extruded Polyvinyl Chloride

E. Resin-Chem: White chemical resistant, fiberglass reinforced thermostat resin sheet. Flame spread rating; 25.

1.03 CONSTRUCTION:

A. Fume hood superstructures shall have a double wall construction consisting of an outer shell of sheet steel and an inner liner of corrosion resistant material as specified. Attachment of the interior lining material to the steel framing members shall be made with non-metallic fasteners. The double wall shall house and conceal steel framing members, attaching brackets and remote operating service fixture valves.

B. The exterior side panels of the superstructure shall be constructed of 18 gauge steel and shall be removable for access into the interior housing. Access shall also be gained through removable panels in the interior liner. These interior removable panels shall be held in place by a PVC gasket.

BMC/FUME HOOD SPECIFICATION
SECTION 11610

C. Each superstructure shall have an internal baffle system of the same material as the interior liner. This baffle system shall provide for safe efficient removal of fumes when the superstructure is connected to a properly installed exhaust system. A manual adjustment shall be provided on the upper part of the baffle to allow the operator to set the hood for heavy or light fumes. All baffles shall be removable for cleaning.

D. Unless specified for use in a variable air volume (VAV) system, the superstructures shall be provided with an air by pass feature. The by-pass, located at the upper front interior of the hood, shall open as the sash is lowered, providing for a relatively constant exhaust volume of the fume hood superstructure.

E. When shown, the upper front exterior panel of the superstructure shall be furnished with louvers. The louvers provide for proper operation of the by-pass feature when the top of the superstructure is closed off to the ceiling. The upper front exterior panel of the superstructure shall also be removable for access.

F. A two tube, rapid start, vapor sealed fluorescent light fixture of maximum length shall be provided on each superstructure. Each fixture shall include two soft white tubes providing 80 candle power at the work surface. Light fixtures shall be re-lamped from the top front of the superstructure.

G. Exhaust outlets shall be rectangular, 18 gauge type 304 stainless steel. Galvanized or painted outlets are not acceptable.

H. Fume hoods shall have a full view, vertical rising, laminated safety glass sash framed with a solid black, PVC extrusion. The sash shall have a full width extruded PVC finger lift. The finger lift shall have a 16 gauge steel tube inserted the full width of the finger lift and shall be fully enclosed by PVC. Sashes with stainless steel or coated steel finger lifts are not acceptable. The sash shall not required the use of a center mullion. Sash guides shall be extruded, black PVC.

BMC/FUME HOOD SPECIFICATION
SECTION 11610

I. The sash shall be counter balanced with a single weight located in the center rear of the superstructure. Two 1/8" diameter stainless steel cables shall connect the sash to the weight. The use of two cables shall act as a safety mechanism keeping the sash from falling in the event that one cable would fail. The cables shall ride on 2" diameter nylon ball bearing pulleys. The cable/pulley assembly shall have an adjustment located on the top of the superstructure for proper alignment of the sash. A cable keeper clip shall be installed on each pulley to prevent the cable from coming off the pulley.

J. A lower airfoil of 14 gauge steel, coated with a black baked on chemical resistant finish, shall act as the sash stop. In addition, the airfoil shall provide a 1" space between the bottom of the sash, in the closed position, and the work surface. This 1" space shall provide for a continuous sweep of fumes from the work surface.

1.04 AIRFOIL BY-PASS FUME HOODS:

A. Constructed as specified above. The airfoil bypass fume hood superstructure shall have a white Resin-Chem interior lining.

1.05 AIRFOIL ADD AIR FUME HOODS:

A. The add air superstructure shall have an 18 gauge painted steel add air plenum. The plenum shall be capable of properly distributing up to 70% of the air requirements of the hood. The add air plenum shall be of standard size and have the ability to be added to any of the standard Airfoil Fume Hoods.

B. The interior lining of the airfoil add air fume hood superstructure shall be white Resin-Chem.

1.06 AIRFOIL RADIOISOTOPE HOODS:

A. The interior lining and work surface of the Radioisotope Superstructure shall be type 304 stainless steel. Seams and joints present in the interior and work surface shall be welded to eliminate pockets, cracks and crevices that would permit a build up of radioactive materials.

B. The work surface shall be an integral welded part of the superstructure. It shall be water tight and furnished with raised edge to contain spills. It shall be properly reinforced to support 200 lbs. per square foot up to a total weight of 1,000 lbs. per hood or base cabinet section.

BMC/FUME HOOD SPECIFICATION
SECTION 11610

C. An 18 gauge type 304 stainless steel frame shall encase the laminated safety glass sash. The vertical sliding sash shall ride in type 304 stainless steel sash guides.

D. Interior removable access panels shall be provided with stainless steel fasteners for access to the interior housing.

E. All other features of the hood are as specified under "Construction".

1.07 AIRFOIL PERCHLORIC ACID FUME HOODS:

A. Perchloric acid fume hood superstructures shall be identified by a label indicating suitability for use with perchloric acid procedures. All exposed parts of the superstructure interior shall be seamless welded coved cornered, type 316, stainless steel.

B. The work surface shall be an integral welded part of the superstructure. It shall be watertight and furnished with a raised edge to contain spills and wash down water. A full width drain through shall be located below the baffle.

C. A water spray (wash down system) consisting of a perforated, stainless steel tube shall be located behind the baffle for rinsing the area behind the baffle. Service fitting control for the wash down system shall be external to the hood, clearly identified and within easy reach.

D. An 18 gauge, type 316 stainless steel frame shall encase the laminated safety glass sash. The vertical sliding sash shall ride in type 316, stainless steel sash guides.

E. Interior removable access panels shall not be provided on perchloric acid superstructures.

F. All other features of the hood are as specified under "Construction".

1.08 LOW BENCH HOODS:

A. Low bench fume hood superstructures shall have a white Resin-Chem interior lining. The sash shall consist of four horizontal sliding, laminated safety glass panels, with a stainless steel edge trim. The panels shall be top hung and ride in an extruded aluminum track which is mounted to a structural stainless steel beam, above the hood opening.

BMC/FUME HOOD SPECIFICATION
SECTION 11610

B. Two removable interior access panels shall be located on each side of the fume hood superstructure.

C. All other features of the low bench fume hood superstructure are specified under "Construction".

1.09 WALK-IN FUME HOODS:

A. Walk-In fume hood superstructures shall have a white Resin-Chem interior lining. The sash shall consist of two vertical sliding laminated safety glass panel as specified under "Construction". Each sash shall have an independent weight cable and pulley system as specified under "Construction".

B. Two removable interior access panels shall be located on each side of the fume hood superstructure.

D. All other features of the walk-in fume hood superstructure are as specified under "Construction".

SECTION 11 60 00
WELDING CURTAINS

PART I - GENERAL

1.1 SUMMARY

A. This Section includes welding curtains and hooks

1.2 SUBMITTALS

A. Product Data: For each curtain

B. Shop Drawings: Show layouts. Include the following:

1. Location of welding curtains and hooks.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified by;

1. Trax Industrial Products
2. Akon Curtain Doors
3. Frommelt Safety Products
4. Or Approved Equal

2.2 WELDING CURTAINS & HOOKS

A. Products: Subject to compliance with requirements, provide the following:

1. Material: Heavy Duty Tinted Curtains (Transparent)– 40mil thick, 3.95 oz. per square foot
2. Size: 5’-0” Widths x 6’-0” High. Add to this dimension to give you proper drape.
3. Temp Rating: 10 degree F to 140 degree F – Temperature Range
4. Color: (5) Red & (5) Blue
5. NFPA fire retardant, CFM fire retardant
6. Finished edges for clean crisp appearance
7. Triple hems for longevity
8. Provide full loop heavy-duty welding hooks at each welding booth. Coordinate amount with welding Curtain Company.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install curtains and hooks at each welding booth, see drawings for location

END OF SECTION

SECTION 11 61 33

STAGE RIGGING AND CURTAIN SYSTEMS

PART 1 GENERAL

1.01 GENERAL CONDITIONS

A. For the sake of brevity these specifications omit phrases such as "(Sub)Contractor shall furnish and install," "unless otherwise indicated or specified," etc., but these phrases are nevertheless implied. Mention of materials and operations requires the (Sub)Contractor to furnish and install such materials and perform such operations complete to the satisfaction of the Architect's Consultant. Exceptions are noted herein or shown on the drawings.

B. No representative of the Owner shall have power to waive the obligations of this contract for the furnishing of good materials or of performing good work, as herein described, in full accordance with the contract documents. The failure of any representative of the Owner to condemn any defective work or materials shall not release the obligation to at once tear out, remove, and properly replace the same at any time prior to final acceptance upon discovery of said defective work or material. When requested, however, the Owner's representative shall observe and accept or reject any material furnished. In the event the material has been accepted once by the Owner's representative, such acceptance shall be binding on the Owner unless it can be clearly shown that such material does not meet the specifications for this work.

C. All equipment and installation shall be the responsibility of a single contractor. This Contractor shall assume complete responsibility for the engineering, fabrication, transportation, and installation of the work in this Section.

D. Field-verify all sizes, measurements and finishes prior to fabrication. Coordinate with scheduled work of other trades. Immediately notify Architect's Consultant in writing of any discrepancies, conflicts, or omissions prior to the commencement of work or correct the same at Contractor's expense.

E. All equipment shall be fabricated, manufactured, and installed in accordance with applicable laws, codes, and standards, including:

1. Rigging Manual (published by the Construction Safety Association)
2. Wire Rope Handbook (published by Wire Rope Corporation of America)
3. Wire Rope Users Manual (published by American Iron and Steel Institute)
4. National Electric Code (NEC)
5. American Society of Mechanical Engineers (ASME)
6. American National Standards Institute (ANSI)
7. American Society for Testing and Materials (ASTM)
8. American Institute of Steel Construction (AISC)
9. IEEE (Institute of Electrical and Electronic Engineers)
10. ICEA (Insulated Cable Engineers Association)
11. National Fire Protection Association (NFPA)
12. National Electrical Manufacturers Association (NEMA)
13. Any and all local governmental or other applicable codes.

F. Where these Specifications call for a higher standard than the above-mentioned rules, the Specifications shall govern.

G. Nothing in these Construction Documents is to be construed to permit work not conforming to applicable Codes.

H. For all requirements not otherwise addressed by this Specification, the work shall be at a minimum compliant with the requirements of ANSI E1.4-1-2016 – Entertainment Technology - Manual Counterweight Rigging Systems and ANSI E1.6-1-2019 – Entertainment Technology – Powered Hoist Systems.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Section, apply to work of this section.

B. Refer to Contract Drawings TR series for plans, graphic representations, schedules, and notations showing Stage Rigging System work.

C. Refer to work by other sections including:

1. Structural steel.
2. Painting and finishing.
3. Rough carpentry.
4. General electrical work (Division 26)
5. Fire protection system.
6. Stage lighting system (“E” series drawings)

1.03 DEFINITIONS

A. The term "Contractor" shall mean the contracting entity, also referred to herein as Stage Rigging Contractor or Manufacturer, responsible for the fabrication, assembly, installation, testing, instruction and completion of all work as covered in these Specifications and related Drawings.

B. The terms "General Contractor" is used herein to refer to organizations, individuals, and their representatives as typically defined for construction projects. These terms refer to parties other than the Rigging Contractor ("Contractor").

C. Technical terms unique to stage rigging and related work shall be construed in the following order, in accordance with:

1. Related Drawings.
2. Specifications
3. Relevant usage and definitions of handbooks, guidebooks, or trade group recommendations by manufacturers' associations or professional and engineering societies, such as ASTM, ASME, ASHRAE, etc.
4. Generally recognized theatrical usage

D. Dead load is defined as the weight of the batten, lift lines, connecting hardware, and any permanently installed equipment including electric cable management.

E. Live load is defined as the load produced by the attachment of portable equipment applied to the batten by the end user but does not include dead loads or environmental loads.

1.04 SCOPE OF WORK

A. Stage Rigging and Curtain Systems will consist of counterweight and motorized rigging in the theatre. Refer to Contract Drawings TR series for plans, graphic representations, schedules, and notations showing Stage Rigging System work.

B. Work under this section shall include the furnishing of all labor, materials, tools, transportation, services, and supervision necessary to complete the installation of the Stage Rigging System, Variable Acoustic Curtains, and other items as herein listed, all as described in these specifications, as illustrated on the drawings, and as directed by the Architect's Consultant. Any question as to the installation of equipment should be cleared with the Architect's Consultant prior to installation. Work is comprised of, but not limited to, the following principal items:

1. Verification of dimensions and conditions at the job site,
2. Line sets, arbors, wire rope, battens, hardware, chain, blocks, etc.,
3. Stage curtains,
4. Curtain tracks and accessories,
5. Motorized hoists and control,
6. Wire, conduit, junction boxes and all other electrical components for motorized hoist and control,
7. Installation all cords and cables supplying electricity or control signal to any equipment supported by equipment furnished under this Section, including cable saddles.
8. Miscellaneous steel for mounting equipment,
9. Miscellaneous components and parts herein specified.
10. Portable and loose equipment
11. Proof of performance testing

C. Furnish and install complete Stage Rigging System with all necessary apparatus, equipment, wiring, etc., required to insure complete systems in excellent working order as specified herein and on the attached diagrams.

D. Consistent with the detailed information contained herein and on the drawings, provide functional and complete overall systems. Verify complete parts lists, the accuracy of the type numbers, and the overall suitability of the equipment to produce complete functional systems coordinated and interfaced with related work.

E. Minor items of equipment needed in order to meet the requirements stated above, even if not specifically mentioned herein or on the drawings, shall be provided in quality equivalent to other conditions on the project with no claim for additional payment.

F. Coordinate with related work provided under other sections, including but not limited to the following:

1. Fire protection systems
2. Stage lighting system
3. Lighting plugging devices
4. Building structure and catwalks
5. Smoke vents and roof hatches
6. General electrical work
7. Orchestra shell
8. Ductwork

1.05 JOB CONDITIONS

A. Coordinate layout and installation of rigging with other adjacent work, including structural, light fixtures, HVAC equipment, plumbing, and fire-suppression elements.

B. Verify all conditions on job site applicable or pertaining to this work. Coordinate with scheduled work of other trades. Notify Architect's Consultant in writing of discrepancies, conflicts, or omissions prior to commencement of work or correct the same at Contractor's expense.

C. The drawings show diagrammatically the arbors, sheaves, running lines, controls, etc. So far as possible the drawings show arrangement of equipment that will fit into the spaces available without interference. If conditions exist at the job site that make it impossible to install work as shown, prepare and submit drawings to the Architect's Consultant for approval showing how the work may be installed, and, on approval, install the work without additional cost to the Owner.

D. Contractor shall take care not to damage any equipment or to disconnect any wiring other than as required to interface new system. Any contractor-damaged equipment shall be repaired or replaced by the Contractor at no additional cost to the Owner. Return any systems disturbed during work to found condition.

E. Deliver materials to the job site such that they will be protected from damage. Store all materials at building site under cover.

1.06 APPROVED FABRICATORS

A. The hoists, motors, hardware and related components specified herein shall be fabricated by the following:

1. Electronic Theatre Controls, Inc., 3031 Pleasant View Rd, Middleton, WI 53562
   www.etcconnect.com
2. H & H Specialties, Inc., 14850 Don Julian Rd., Ste B, City of Industry, California 91746
   www.hhspecialties.com
3. Protech, 3431 N. Bruce St., North Las Vegas, NV 89030
   www.protechlv.com
4. Steeldeck Hall Stage Limited, Unit B, 203-207 Manor Road, Erith, Kent DA8 2AA, UK
   www.hallstage.com
5. Texas Scenic Company, 8053 Potranco Rd, San Antonio, Texas, 78251
   www.texasscenic.com
6. Tiffin Scenic Studios, Inc., 146 Riverside Drive, Tiffin, Ohio 44883
   www.tiffinscenic.com
7. Wenger Corp/J. R. Clancy, Inc., 7041 Interstate Island Road, Syracuse, New York, 13209
   www.jrclancy.com

B. The draperies and related components specified herein shall be fabricated by the following:

1. I Weiss & Sons, 815 Fairview Avenue #10, Fairview, NJ 07022
   www.i-weiss.com
2. J B Martin Corporation, 645 5th Avenue, Suite 400, New York, NY 10022
   www.jbmartin.com
3. KM Fabrics, Inc., Box 7379, Branwood Station, Greenville, SC 29610
4. Rose Brand, 4 Emerson Lane, Secaucus, New Jersey 07094
   www.rosebrand.com

5. Stage Decoration & Supplies, Inc., 3519 Associate Drive, Greensboro, NC 27405
   www.stagedec.com
6. Syracuse Scenery & Stage Lighting Co., Inc., 101 Monarch Drive, Liverpool, NY 13088
   www.syracusescenery.com
7. Texas Scenic Company, 8053 Potranco Rd, San Antonio, Texas, 78251
   www.texasscenic.com
8. Tiffin Scenic Studios, Inc., 146 Riverside Drive, Tiffin, Ohio 44883
   www.tiffinscenic.com

C. The track, track hardware, and related components specified herein shall be fabricated by the following:

1. Automatic Devices Company, 2121 South 12th Street, Allentown, PA 18103
   www.automaticdevices.com
2. H & H Specialties, Inc., 2203 Edwards Avenue, South El Monte, CA 91733
   www.hhspecialties.com
3. Steeldeck Hall Stage Limited, Unit B, 203-207 Manor Road, Erith, Kent DA8 2AA, UK
   www.hallstage.com
4. Texas Scenic Company, 8053 Potranco Rd, San Antonio, Texas, 78251
   www.texasscenic.com

1.07 RIGGING CONTRACTOR QUALIFICATION

A. Qualified rigging contractors shall have been actively engaged in the sales and installation of theatrical rigging systems and equipment for a minimum of five years. In addition, the qualified contractor shall have completed a minimum of three projects of similar scope and magnitude within the last five years. Contractors not demonstrating this minimum experience at the time of bid submission will not be considered qualified to perform the work specified in this section.

B. Contractor shall employ only experienced stage riggers to direct the installation of work of this Section. A competent supervisor shall be maintained on this Project during the entire installation. The Contractor shall employ a qualified theatre rigger to review installation of the system as it related to attachment to the Theatrical Rigging System and to building structure.

C. All equipment and installation shall be the responsibility of a single contractor. This Contractor shall assume complete responsibility for the engineering, fabrication, transportation, and installation of the work in this Section.

D. Approved contractors may, at their option, arrange for sub-contract field and special shop work to be done by others. Bid submissions must identify such subcontractors and indicate the work they are to do.

E. Approval indicates approval of the manufacturer only and not approval of specific products. The Contractor shall be required to provide equipment that will meet or exceed the intent of these specifications.

1.08 SUBSTITUTIONS

A. Notwithstanding any reference in the specifications to any article, device, product, materials, fixtures, form, or type of construction by name, make, or catalog number, such reference shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. The Contractor in such cases, may at his option use any article, device, product, material, fixture, form or type of construction which in the judgment of the Architect's Consultant expressed in writing, is equivalent to that specified.

B. All materials and equipment specified herein have been determined to provide an overall physical appearance and background of proven operation desired by the Owner, and therefore, to establish a standard of quality required for this project. If equipment or material other than that specified is proposed to be furnished, this Contractor shall be required to furnish the Architect's Consultant with such samples as he requires, the same to be submitted by the Architect's Consultant to an independent testing laboratory selected by the Owner for tests to determine the actual equality of the proposed substitute items. All costs and charges incurred by these tests shall be borne by the Contractor. Should such tests prove the substitute materials and equipment equal and acceptable, the Contractor shall be so advised. However, the Owner reserves the right to examine, and where necessary, to have additional tests made by the same independent testing laboratory of the actual equipment delivered to the job site to insure that the delivered equipment is equal in fact to that specified. Should such secondary tests prove the equipment is satisfactory, the Owner will pay the cost for such tests. Otherwise, the Contractor shall pay for the test and shall proceed to remove unacceptable equipment from the job site and to provide that specified. The Architect's Consultant's decision, based on this test, will be final.

C. The plans and specifications are based on specific equipment, accessories, processes and arrangements as indicated herein. Acceptance of the shop drawing submittal indicates only the acceptance of the manufacturer and quality and assumes that the specific requirements and arrangements are in compliance with the intent of the plans and specifications. The Contractor shall, at no additional cost to the Owner, furnish all accessories, layouts, equipment, etc., and shall perform all work necessary for proper functioning and to fit his substitute items to the intent and arrangement indicated in the specifications.

D. If a substitute system is selected, the Contractor, at no additional cost, shall provide any changes in architectural, electrical, or structural systems required as a result of the alternate system to the Owner. The decision of the Architect's Consultant as to the compliance of the proposed system based on the submitted data and demonstrated system shall be final.

1.09 SHOP DRAWINGS AND SAMPLES

A. Shop drawings and equipment data sheets shall be submitted to the Architect's Consultant in accordance with the requirements of these specifications within 90 days after award of the contract. Failure to comply with this 90-day requirement shall be cause for disqualification of the Contractor and cancellation of the contract without cost to the Owner on the basis that the Contractor has not demonstrated the ability or intention to comply with the Contract Documents.

B. Prepare all shop drawings and field changes under the supervision of a professional structural engineer so licensed by the state of the installation. As a courtesy, the first shop drawing submission does not require a Professional Engineer's stamp. Contractor shall issue a final shop drawing submittal with stamp prior to manufacture. All as-built drawings shall be stamped and certified by professional engineer. Structural Engineer's review shall include, but not be limited to, all elements related to overhead lifting, structural support of elements and all suspended elements provided under this section, including field modifications.

C. Acceptance of submitted equipment shall be obtained prior to equipment purchasing or fabrication. If shop drawings are rejected, correct and resubmit in the manner as specified. All shop drawing information shall be submitted at the same time; no partial submittals will be reviewed. Review is for conformance with design intentions only. Review does not relieve contractor of responsibility to verify field conditions; nor does it relieve the contractor of responsibility for errors, omissions, or deviations in submittals.

D. The Contractor assumes responsibility for the accuracy of all dimensions and quantities.

E. Shop drawings shall be performed at a scale of not less than 1/4" = 1'-0" for plans and sections and 1" = 1'-0" for details. Drawings and catalogs shall be marked to show the name of project, date, Owner, Architect's Consultant, Contractor and/or manufacturer and supplier.

F. Drawings: Submit complete sets of drawings for review in Portable Document Format (PDF). Drawings shall indicate complete details and dimensions of all work to be performed. PDF shall include a Table of contents and bill of materials. Document shall also contain PDF bookmarks to plans, sections and major system details. Include all equipment types and locations, clearances required, guides, chains, linesets, contractor-fabricated equipment and all other details required to describe work to be performed. Shop drawings shall contain at least the following details:

1. Groove details for all sheaves and drums
2. Complete rigging schematics with weights of all equipment
3. Elevations of each rigging and curtain set type
4. Complete hanging/attachment details
5. Complete hardware details
6. Weights of all equipment
7. Schematic diagrams of all electrical work including motorized hoists
8. Manufacturer's data sheets
9. Indication of all variance from contract drawings

G. Catalog Sheets: Submit copies of catalog data sheets (8-1/2" x 11"), neatly organized in sets with title page, table of contents, space for submittal stamps, and bookmarks between sections. Additional copies of this set of data sheets are required with as-built drawings. Shop drawing submittal shall contain data sheets in proper order with part or model number clearly indicated on all equipment proposed. Provide a complete list of proposed equipment with reference to its corresponding specification section/paragraph number or equipment title. Denote all deviations from specified equipment on the list.

H. Fabric Samples: Submit a minimum of two (2) sets of samples of all curtain materials with full range of colors and patterns available.

I. Finished Curtain Samples: Submit two (2) finished samples of each of curtain type. Each sample should be approximately 3' x 3' and consist of all details that will be included in the complete finished curtain less the hanging hardware. The traveler sample may have 4" hems (sample only) with specified fullness and other specified features. All other samples shall have specified hems, webbing, grommets, tie line and pipe pocket. Samples shall include but not limited to:

1. Main Curtain and Valance
2. Travelers
3. Legs/Borders
4. Cycloramas
5. Scrims
6. Projection Screens
7. Heat Stop Borders
8. Acoustical Drapes

1.10 RECORDS FOR OWNER

A. Drawings: Maintain a full record set of drawings on the job to show the actual installation of the work performed. All as-built drawings shall be stamped and certified by Professional Engineer, and reflect field modifications. Submit four (4) hard copy sets of drawings and four (4) USB drives of electronic copy in PDF format showing 'as installed' work to the Architect's Consultant for initial review. If 'as installed' documents are rejected, correct and resubmit in the manner specified.

B. Manuals: At the time of project closeout, submit four (4) sets each of the following manuals to the Architect's Consultant for review. Manuals (8-1/2" x 11") are to be neatly bound and include title page with the name of the project, date, Owner, Architect's Consultant, Contractor, Contractor and/or Manufacturer and Supplier. The manuals to be supplied are as follows:

1. Operation and Instruction Manual, including:

   a. Table of contents
   b. Brief description of the operation of each system, (descriptions shall be written such that new personnel may read the manual and be able to set-up and operate the system).
   c. Manufacturer's operation instructions for all user-operated equipment.
   d. Small scale, clear laminated plan(s) showing the location of all equipment.

2. Maintenance Data Manual, including:

   a. Table of contents
   b. A list of all equipment supplied by this contract with manufacturer's name, model and part number.
   c. A listing of equipment manufacturer's/supplier's addresses for all equipment covered by this contract.
   d. All equipment warranties and guarantees including contractor's guarantee. Explain the limits of the warranty, and whom to contact for service, etc.
   e. Manufacturer's owner and service manuals on all equipment under this contract.
   f. Replacement parts lists of all major items and equipment indicating specific part ordering numbers.
   g. Approved shop drawing catalog data sheets.
   h. All test results required under these specifications. Videos shall be submitted in DVD format.
   i. Any and all other data and/or drawings required during construction.

1.11 TESTS AND OBSERVATIONS

A. The complete job shall be, during and/or after construction, subject to the following tests and observations:

1. By Architect's Consultant observations and tests conducted by or for Consultant in Consultant's presence. Upon notice, Contractor shall furnish not to exceed two (2) persons (one to be the job foreman) and tools to assist for a reasonable amount of time to make such tests and observations as are requested by the Architect's Consultant.
2. By any Government or local authority.
3. Operation and visual examination of all components.
4. Contractor shall demonstrate for Architect's Consultant, full load testing of all motorized sets that suspend loads. Testing shall include full range of travel in all axes of movement, directed by the installed control system. Test shall include both controlled stop and emergency stop conditions. Test weight shall be equal to the live load listed on the

Drawings. Contractor shall arrange for delivery, mounting and de-mounting of weight on motorized sets, and removal of test weight from project site.

a. For all sets, a test with the weight uniformly distributed across all lift lines shall be performed.
b. For ten percent of each set type, but not less than one per type, a test with the weight eccentrically distributed shall be performed. Test weight shall be equal to the capacity of the set and distributed so that one lift line shall carry the maximum load per lift line as shown in the Drawings.
c. Testing must be video-recorded with audio and submitted with written certification for each set.
d. Motorized curtain sets where the curtains are intended to be easily removable (legs, borders, etc.) shall be tested prior to curtain installation.
e. Motorized curtain line sets where the curtain is intended to be permanently mounted (bi-parting travelers, proscenium reduction curtains, etc.) shall have the required curtain and hardware installed prior to the full load testing.
f. Cable management systems on stage electrics, along with required plug strip, plug box, etc., must be installed and operating normally during the test.
g. Line sets that have orchestra enclosure ceilings that are intended to be permanently mounted shall have the ceilings mounted and all cable management installed and operating properly.

5. Simulated failure test of mechanical over-speed brakes. Test shall be simulated so as not to compromise the integrity of the installed components. Test does not need to be performed on site but must be video-recorded and submitted. In lieu of this test, manufacturer may supply written certification of a successful test of representative samples.
6. Verification and fine-tuning of all hoist limit switch settings (ultimate and normal).

a. Line sets intended for masking curtains shall be tested prior to curtain installation.
b. Line sets for orchestra enclosure ceilings intended to be permanently mounted shall be tested after the ceiling and associated cable management is completely installed.
c. Line sets for orchestra enclosure ceilings intended to be removeable shall have limit switches tested with the ceiling removed from the batten.

B. After completion of installation and preliminary tests by the Contractor, observation of the work shall be performed by the Architect's Consultant.

1. The Contractor shall certify in writing to the Architect that the work is complete and ready for observation.
2. System commissioning shall be supervised by a knowledgeable representative of the Contractor.
3. In order for the Architect's Consultant to conduct system commissioning observation, the following elements must be in place:

a. Rigging system must be complete, and curtains installed. See exception for curtains on motorized line sets in paragraph A above.
b. Rigging control system must be operational.
c. All electrical components must be operating on permanent building power.
d. Preliminary hard limit positions set.
e. Stage electric line sets complete with plug strips, plug boxes, or other distribution devices as required along with complete cable management required for the device(s)
f. Permanently installed orchestra enclosure ceilings with complete cable management.
g. Complete access to areas where the rigging systems are installed, including the stage house, control panels, motors, and other system components.

h. Stage floor installation complete.

4. Contractor is to provide any equipment that may be necessary to access system components, including personnel lifts and/or ladders.
5. Contractor shall provide two personnel to operate equipment during commissioning observation. These technicians must be familiar with safe operating procedures for this equipment.

C. The cost of periodic trips to the job site for final observation by the Architect's Consultant has been provided for in the Architect's Consultant's contract. The cost of any additional trips to the job site due to delays, omissions, or mistakes by the Contractor shall be borne by the Contractor.

D. The Contractor shall make any adjustments or modifications necessary from the punch list to bring the work into conformance with established Contract requirements and shall then certify that all work is complete and ready for final observation.

1. The Architect's Consultant will perform a final review to verify punch list completion.
2. A knowledgeable representative of the Contractor must be present for the final review, with crew as required to move system components.
3. Should deficiencies due to faulty equipment or installation require re-inspection after final inspection, all expenses of such re-inspection, including time and travel of the Architects or Architect's Consultants shall be the responsibility of the Contractor without cost to the Owner.

E. After final review of the system, the Architect's Consultant will perform acoustic tuning.

1. The following work must be complete prior to acoustic tuning.

a. Curtains complete and operational.
b. Control system operational
c. Preliminary limits set

2. The Contractor shall assist with acoustic tuning with the Architect's Consultant.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver curtains until spaces to receive them are clean, dry, and ready for their installation. Ship to jobsite only after roughing-in, painting and other finishing work has been completed, installation areas are ready to accept work. If curtains are installed before dust-generating work is complete, curtains shall be appropriately protected from damage.

B. Handle and install materials to avoid damage.

1.13 GUARANTEE

A. All labor and materials provided under this contract, unless otherwise noted, shall be guaranteed for a period of one (1) year following the date of final acceptance of the installation.

B. The following equipment provided under this contract shall be guaranteed for a period of two (2) years following the date of final acceptance of the installation

1. Motorized gear/motor/brake assemblies.
2. Motorized hoist control system.
3. Index striplight – LED and controls.

C. All equipment with factory warranties greater than one year shall have their warranties under the Owner's name.

D. All defects occurring in labor or materials within the guarantee period shall be rectified by replacement or repair. Contractor shall, within this guarantee period, be required to answer all service calls within a 24-hour period and repair or replace any faulty item within 48 hours after the initial service call without charge to the Owner.

PART 2 PRODUCTS

2.01 GENERAL

A. All materials shall be new and of first quality.

B. State-of-the-art assurance: No products shall be accepted if they have been discontinued or superseded at the time of shipment. For such items, the manufacturer shall make products of comparable function to the specification available to the project at no additional cost. Should the manufacturer have developed a later model of specified units, the latest developed unit shall be provided without additional cost to the Owner. Should the manufacturer develop products of comparable function above and beyond the specification of the listed product, the manufacturer may offer the newly developed product for use on the project. The manufacturer shall notify the Architect's Consultant of any developments to the specified products and shall note any change in the requirements of building infrastructure(s) to support the developments. The Architect and Architect's Consultant shall then determine whether upgraded products shall be accepted.

C. All load bearing rigging components shall be rated for overhead lifting; capable of supporting design loads as shown and shall be of, or treated with, corrosion resistant materials. Where not specifically called out in this Section, rope and wire rope shall be selected using a minimum design factor of eight to one, (8:1). All chain, shackles, and other hardware shall be selected using a minimum design factor of five to one, (5:1).

D. Operating parts of all equipment shall be machine finished, and tolerances, finishes, fit, etc., where not specified, shall conform to good trade practices.

E. All items necessary for a complete, operational, and safe system shall be provided, including bolts, nuts, washers, fittings, anchors, supports, hinges, and all other items required for completeness and operational safety. Where not specified elsewhere in this Section, all bolts shall be Grade 5 or better.

F. The rigging products of certain manufacturers are specified by catalog number for establishing a standard of quality. Items equal in quality and performance by manufacturers other than those specified will be permissible upon acceptance by the Architect’s Consultant.

G. Equipment quantities are "as required" or "as shown on drawings" or "as specified elsewhere" unless otherwise noted.

H. Provide all guards and other protective devices required to ensure protection of individuals who may be near or adjacent to equipment and devices during normal operation.

I. Loading capacity of systems is defined as the live load exclusive of the dead load.

J. Dead load is defined as installed infrastructure such as pipe battens, truss battens, sandbags, hooks, plug strips, etc.

K. Should the Contractor choose to suggest alternate methods that require heavier dead loads, the Contractor shall be responsible for increasing the capacities of the individual components, including the arbor capacities, accordingly. Any alternate methods must be approved specifically by the Architect's Consultant.

2.02 ENGINEERING RESPONSIBILITY

A. The engineering of all equipment, devices, machinery, and systems shall have the following considerations:

1. Safety to personnel during operation, use, and maintenance.
2. Adequate load supporting capability and fail-safe design.
3. Proper consideration of all systems and elements, including electrical insulation levels, interrupting capacities, protective relays, impact strength, breaking strength, emergency stopping distances, acceleration and decelerations rates, and normal working stress capabilities of equipment and all components.
4. Reliability, with consideration for special or unusual requirements of the unit or installation.
5. Ease of operation and maintenance.
6. System operating sequences, including accounting for simultaneous as well as sequential operation of systems and sub-systems.
7. Coordination with associated and/or adjacent systems provided by others.
8. Quiet operation.

2.03 MISCELLANEOUS COMPONENTS AND SUPPLEMENTAL SUPPORT

A. Additional supplemental support structure not furnished under other sections and other fittings required for installation, support, bracing and/or operation of Stage Rigging System components are the responsibility of this Section. Provide all supplementary support necessary for safe and proper static and dynamic conditions of all systems and components required for the work of the Specifications. All attachments, anchorages, connections, and miscellaneous supplemental support shall be designed, supplied, and installed by the Contractor and reviewed by the Architect's Consultant.

B. Special components may be required for muling around structural components to meet wire rope fleet angle requirements, supporting hoisting cable, or dropping lines through structure to battens. These special components shall meet or exceed comparable equipment specified herein. Idler blocks, pivot blocks, structural support for these blocks, etc., required to make all lines fully operable, whether such components are specifically named or not, shall be furnished without claim for additional payment.

C. Additional mounting components, such as miscellaneous steel, wood blocking, and fittings, required for installation, support, bracing, and operation of equipment under this Section shall be provided without claim for additional payment. These components shall be coordinated with other trades.

D. Patented channel type structural steel shall accommodate the required load but shall equal Unistrut Series P1000 at minimum.

E. Flame cutting is not acceptable.

F. Miscellaneous steel shall be of suitable types and sizes. All straps, rods, anchors, clip anchors, clip angles, and other hardware necessary for the attachment shall be supplied.

G. This Contractor shall coordinate these locations and requirements with the General Contractor.

H. All methods of connection and imposed loads resulting from the Contractor's work shall be submitted to the Architect's Consultant prior to fabrication.

2.04 ARBOR GUIDE SYSTEM

A. T-track system shall be 1-1/2" x 1-1/2" x 3/16" steel or 2" x 2" x 1/4" aluminum tees, or jays, spaced as shown on the Drawings. Tees shall be Clancy type 1500 with appropriate number of Type 215 or 315 U Plates. All spreader U plates shall be bolted to continuous angle wall battens. 1-3/4" x 1-3/4" x 3/16" steel angle wall battens shall be mounted 5'-0" apart vertically over the entire area of the arbor guide battery. Both legs of the wall battens shall be slot punched to provide for any alignment of the tees made necessary by irregularities in the wall. The tee bar shall also be slot punched in order to provide for vertical alignment of the guide system. Tees shall extend upward to underside of head block beams.

B. Top and bottom stops of hardwood bumpers with steel angle backing shall be provided to control limits of arbor travel. The top and bottom stop battens and the floor batten shall be secured to the tee bar, and the 3" x 6" floor batten shall be secured to the floor by means of 3/8" x 2" lag screws.

C. Provide adjustable stops on tees, or jays, to limit upward travel of tension blocks.

D. Any splices in T-track must be smooth and free from any burns, or notches that could catch arbor shoe.

2.05 ARBOR – FRONT LOADING

A. Arbor

1. The arbor shall be a front-loading type. The arbor shall restrain the counterweight bricks on three sides.
2. The arbor shall have a spring-activated, self-closing front lock bar or cover to prevent bricks from sliding out the front of the arbor. The lock shall engage and lock in the slot or indentation at the front of the counterweight bricks in the event the bricks slide forward in the arbor.
3. The arbor shall have shelves fixed in place no more than 24 inches apart. Arbors requiring spreader plates are not acceptable. Arbors without shelves are not acceptable. The arbor shelves shall impose an angle on the counterweight bricks causing them to be slanted toward the back of the arbor.
4. The arbor shall not have bolt heads, bolt shanks or nuts protruding from the sides of the arbor.
5. The arbor shall be single purchase and shall have tie off points for up to 10 loft lines and for one hand line matching the diameter indicated in the schedules.
6. The arbor shall be sized to accommodate enough counterweights to balance the pipe batten and related equipment when the batten is carrying its rated live load as indicated in the Rigging Schedule. Arbors shall be designed to smoothly operate on 8" centers.
7. Arbors shall utilize chain compensation to balance the transfer of lift line weight from arbor to batten between low and high trim.
8. Paint lineset number on backbone of arbor in yellow paint 2" tall and on arbor side plate for visibility from side.
9. Provide yellow pipe weight marker to indicate counterweights needed to balance empty batten.
10. Arbor shall have a bull ring on the bottom of the arbor.

B. Approved Equipment:

1. Thern Stage Equipment - Brickhouse

2. Wenger /J.R. Clancy - FrontLoader

C. Quantity: One per counterweight line set.

2.06 ARBOR GUIDE

A. At each end of the arbor there shall be a ball bearing roller guide assembly. Each assembly shall consist of the following: Two 3 ½" Nylatron GS guide wheels; 6-3/8" x 3" x 3/16" steel back-up plates. Each guide assembly shall be secured to the tie-plate and the top and bottom of the arbor by means of at least two 3/8" grade 5 bolts and nuts.

B. Approved Equipment:

1. J.R. Clancy, Inc. 007-TBRG
2. H & H Specialties, Inc. Model 991RG

2.07 LOCKING RAIL

A. Locking rails for the arbor guide system shall be fabricated as shown on drawings and shall consist of the required steel angles, braces, etc., to facilitate the mounting of one rope lock for each lineset and a pin rail for hanging plug box rope sets. Provide adjustable stops for tensioning floor blocks on the tees, or jays, to limit upward travel of each take-up block. Provide a 2" x 2" hardwood arbor stop mounted to the top back steel angle. The locking rail shall be designed and installed in such a way as to resist a maximum uplift of 500 pounds per linear foot of locking rail as mounted to the floor. This shall be accomplished by use of an expansion or adhesion anchor into the concrete floor installed per anchor manufacturer's instruction. When unable to anchor to concrete, anchor in manner which shall meet the loads specified above.

B. Locking rail index card

1. Provide an index card permanently attached to the lock rail at each rope lock.
2. Index card to be lamicoid or heavy gauge plastic. Card shall contain the following information permanently adhered to the card:

a. Lineset number in upper left corner
b. Space to write identifying equipment placed on the lineset.

C. At stage level, provide a reaction bar for use with a portable capstan winch.

D. Where locking rails are located on floor edges, rail shall include a min. 3" kickplate and expanded mesh between stanchions to within 6" of the underside of locking rail.

E. Approved Equipment:

1. Floor mount

a. JR Clancy Series 011-538xx (modified for pin rail)
b. H&H Specialties model 578

F. Quantity: As shown on drawings

2.08 ROPE LOCK

A. Rope lock shall be positive locking, quick-release type with thumbscrew adjustment for rope size. Body shall be fabricated of heavy-duty ductile iron. Jaws shall be fabricated of gray iron and sized to fit specified arbor control line.

B. Rope lock shall have 9" steel handle encased in plastic. Rope lock ring shall also be encased in plastic. Rope lock and rope lock handle shall be smooth finished and free of all cast flashing and sharp edges.

C. Provide rubber bumper for the handle to land on when opened and spring washers between the dogs and the house to provide silent operation.

D. Rope lock shall be capable of being secured (padlocked) in closed position.

E. Approved Equipment:

1. Thern Stage Equipment, Inc. Model No. RL2-50
2. J.R. Clancy, Inc. Model No. 533R
3. H & H Specialties, Inc. Model No. 576-9

F. Quantity: One per counterweight lineset per locking gallery.

2.09 FLOOR BLOCK

A. Floor block on T-track for tensioning arbor control line. Sheave shall be 10" with 5/8" SAE Grade 2 or better steel shaft and sealed precision ball bearings. Bottom half of sheave shall be completely enclosed in block assembly. T-track guide assembly shall consist of two steel shoe guides and one spacer. Each lineset shall be installed with respective floor block on the T-track at ½ way up their total travel to allow for stretch of arbor control line. Tension blocks will be re-adjusted, as needed, before final checkout. Rope groove shall be sized for specified arbor control line, smooth finished and free of all cast flashing. Minimum weight of block shall be 40#.

B. Sheave:

1. 10” for ¾” purchase line
2. 12” for 1” purchase line

C. Approved Equipment:

1. Thern Stage Equipment, Inc. Model FB12
2. J.R. Clancy, Inc. Model No. 1015
3. H & H Specialties, Inc. Model No. 70

D. Quantity: One per counterweight lineset.

2.10 HEAD BLOCKS

A. Head blocks shall have one sheave of sufficient width to accommodate required number of wire rope grooves and one arbor control line. Sheave shall conform to cable manufacturer's recommendation on depth and design of grooves and shall have 1/64" tolerance. Pitch diameter from any wire rope groove to any other shall not vary by more than .001". Head blocks shall be equipped with life-time lubricated Timken tapered roller bearings. The shaft shall be SAE Grade 8 steel bolt with head keyed to prevent shaft rotation. Insert steel sleeve into bore to provide bearing

surface for roller bearings. Head blocks shall be equipped with at least 3 spacers of 1/2" pipe to prevent jumping of wire rope from the grooves. Side plates shall be at least 10 gauge securely welded to base frame with a continuous staggered weld. Provide base angles and auxiliary base angles as necessary for support to structure. Fasteners shall be SAE Grade 5 or better.

B. Sheave Material: Nylatron GSM

C. Sheave Diameter:

1. Standard Rigging - 12"
2. High capacity – 16”

D. Minimum Shaft Diameter:

1. Standard Rigging - 1"
2. High capacity – 1-1/2”

E. Approved Equipment:

1. Thern Stage Equipment, Inc. Series HB
2. J.R. Clancy, Inc. Series 55
3. H & H Specialties, Inc., Series 50

F. Quantity: One per counterweight lineset

2.11 LOFT BLOCKS AND MULE BLOCKS

A. Loft blocks and mule blocks shall have one sheave (mules may require more than one sheave) of sufficient width to accommodate required number of wire rope grooves. Sheave shall conform to cable manufacturer's recommendation on depth and design of groove and shall have a 1/64" tolerance. Pitch diameter from any groove to any other shall not vary by more than .001". Blocks shall be equipped with life-time lubricated, sealed bearings as specified below. The shaft shall be SAE Grade 8 steel bolt with head keyed to prevent shaft rotation. Blocks shall be equipped with at least 2 spacers of 1/2" pipe to prevent jumping of cable from the grooves. Side plates shall be at least 10 gauge securely welded to base frame with a continuous staggered weld. Provide base angles as necessary for support to structure. Fasteners shall be SAE Grade 5 or better.

B. Provide idlers on each block with sufficient number of sheaves to support passing wire rope on each loft block.

C. Provide a multiline sheave for the first loft block (line 1) on each counterweight set.

D. Approved Sheave Material:

1. NYLATRON GS
2. ZYTEL GRZ

E. Sheave Diameter:

1. Standard Rigging - 8"
2. High Capacity – 12”
3. Speaker Rigging – As required to meet loading criteria

F. Bearings:

1. Standard Rigging Loft Blocks - Precision Ball Bearings
2. Standard Rigging Mule Blocks with two or less lines - Precision Ball Bearings
3. Standard Rigging Mule Blocks with three or more lines - Sealed Timken Tapered Roller Bearings

G. Minimum Shaft Diameter:

1. Standard rigging - 5/8"
2. High capacity - 1"

H. Approved Equipment:

1. Upright Loft Block: H & H Specialties Series 840N25
2. Underhung Loft Block: Thern Stage Equipment, Inc. Series LB
3. Underhung Loft Block: H & H Specialties Series 30
4. Underhung Pivot Loft Block: H & H Specialties Series 44NS
5. Underhung Swivel Loft Block: H & H Specialties Series 46NS
6. Upright Mule Block: Atlas Silk Series 80NS
7. Underhung Mule Block: H & H Specialties Series 81NS

I. Quantity: Refer to drawings and as required

2.12 WIRE ROPE

A. Wire rope shall be first quality, galvanized carbon steel, and impregnated with a dry lubricant. All cable ends shall be neat, seized and smoothed to prevent scratching and catching. Wire rope shall be terminated with cable thimbles and utilize one of the following termination methods:

1. Nicopress sleeves as manufactured by National Telephone Supply, applied in conformity with manufacturer's instructions.
2. Forged wire rope clips as manufactured by The Crosby Group, Inc. (Crosby® Clips), applied in conformity with manufacturer's instructions.

B. Wire Rope Diameter:

1. Standard Rigging – 1/4"
2. Motorized Rigging – 3/8”

C. Approved Equipment:

1. Hoist and Rigging – Macwhyte 7 x 19 Utility Cable
2. Guide – Macwhyte 7 x 7 Non-Flexible Utility Strand

2.13 HOIST LINE TERMINATION ASSEMBLIES - WIRE ROPE

A. Batten connection:

1. Type 1 – Wire rope shall be terminated as specified elsewhere or as shown on drawings and fitted with 36" long trim chain. Trim chain shall be connected through the cable thimble and terminated as specified elsewhere. Chain shall make at least one full wrap around the pipe batten. Type 1 terminations will be installed on all single batten linesets unless otherwise noted

2. Type 2 – Wire rope shall be as specified elsewhere or as shown on drawings and fitted with rated jaw-jaw turnbuckles. Type 2 terminations will be installed on all double batten linesets unless otherwise noted.

B. Arbor terminations - Wire rope shall be terminated as specified elsewhere and fitted with an appropriately sized screw pin shackle attached to the arbor top. Mouse shackle with wire after installation.

2.14 CHAIN

A. Dead hanging battens and batten termination assemblies (trim chains).

1. Each chain shall be 36-inches long fabricated from 1/4-inch alloy Theatrical Chain, specifically designed for theatrical overhead lifting applications.
2. The chain shall have a minimum breaking strength of 13,000 pounds.
3. The chain shall be compatible with industry-recognized chain hardware. Individual link size shall match the National Association of Chain Manufacturers, Welded Steel Chain Specifications for Grade 30 Proof Coil Chain.
4. Each link of the chain shall be stamped with the manufacturer's identifying mark.
5. The chain shall be lot traceable, with a coded date stamp on every tenth link of chain.
6. Chain shall have a black finish.

B. Approved product:

1. Wenger/J.R. Clancy Alpha Chain
2. Texas Scenic Company, Theatrical Chain
3. Peerless Theatrical Rigging Chain

2.15 CHAIN TERMINATIONS

A. A shackle shall be used for termination of dead hanging chain and hoist line terminations (trim chains). Shackles shall be "moused" shut with wire, after proper installation

1. Approved Equipment: Crosby Load Rated Forged Screw Pin Anchor Shackle.

B. Quick link for termination of certain special components. Quick links may only be utilized when specifically indicated herein or on drawings.

1. Approved Equipment: Cooper Group Rapid Link load rated at 880 lbs.

2.16 BATTENS

A. Pipe battens shall be nominal 1 ½" black steel pipe (1.9" O.D.) ASTM A53/A Strong (Schedule 40), stripped and painted with at least one coat of black primer and one coat of flat black paint free of surface irregularities, in lengths as indicated on rigging schedule.

B. Splices shall be close-fitting internal steel sleeves with a wall thickness of not less than 0.1875 inch, and min. 24 inches long. Both sides of the splice shall be held in place with a minimum of two (2) plug welds per side. Splices may also be bolted with two bolts evenly spaced on each side of the splice. Bolts shall be oriented 90° off access from adjacent bolts. Bolt length shall not extend more than three threads beyond the properly tightened nut.

C. Battens shall be engineered and installed for straight installation.

D. All battens shall have bright yellow end caps on each end for visibility in the loft. End caps shall be a minimum of 6” long and provide a smooth surface to the batten end. Line set number shall be stenciled on each end of each batten inside of the end caps, in contrasting color paint, such that the number is readable from the floor when the pipe is flown out and from position upstage of the batten when the pipe is flown in. In lieu of end caps, battens can be painted for 24” on each end with bright yellow enamel.

E. Paint on every batten a 1” wide strip at center stage of the batten.

2.17 PIPE CLAMPS

A. For connection of temporary pipe lengths to permanent lighting and rigging pipe structures.

B. Clamps shall be sized to connect to 1-1/2” (1.9” O.D.) black steel pipe.

C. Rotalocks shall be designed to connect horizontal pipes to vertical pipes at a 90-degree fixed angle. Minimum working load limit shall be

D. Couplers shall be designed to connect pipes in a horizontal orientation. Minimum working load limit shall be 1100 pounds. Couplers shall use wing nuts to tighten clamps without requiring the use of tools.

E. Rotalock Approved equipment:

1. Alvin Industrial AIS79-8
2. Sapsis Rigging Inc Steel Pipe Clamp – 1-1/2”

F. Swivel or Fixed 90 deg. Coupler Approved Equipment:

1. The Light Source Swivel Coupler
2. Doughty Engineering Swivel Couplers

G. Quantity:

1. Rotalocks: Four (4)
2. Swivel Couplers: Four (4)
3. Fixed 90 deg. Couplers: Four (4)

2.18 SAND BAGS

A. For counterweight of hanging plug boxes.

B. Provide clean, dry, non-toxic sand with each bag in quantity to counterweight each plug box.

C. Attach bag utilizing an endless loop sunday fabricated of 4' of specified flexible wire rope.

D. Approved Equipment: J.R. Clancy #1096

E. Quantity: Eight (8) sand bag assemblies.

2.19 FIBER ROPE

A. Fiber rope shall be a synthetic rope consisting of combination filament and staple/spun polyester wrapped around fibrillated polyolefin.

B. Fiber rope diameter:

1. Grand Drape – 1”
2. All other counterweight sets – 3/4”
3. Spot Lines – 5/8”
4. Hanging plug boxes – 5/8”

C. Approved Equipment:

1. Counterweight sets: New England Ropes, 3-Strand Composite Multiline II, 3 STML-689. Color: White.
2. Spot line: New England Ropes, Stage Set-X. Color: Black.
3. Hanging plug boxes: New England Ropes, Multiline II, Color: Black.

D. Quantity:

1. Counterweight: As required by drawings.
2. Spot line rope for hanging plug boxes: provided in length to allow plug box to extend full length of SO electrical cable and still make three wraps on the pin rail.
3. Spot line rope delivered to owner: plus 500’ delivered to Owner on spool

2.20 FIBER ROPE BLOCKS

A. Block shall be designed for a dynamic load of 300 pounds.

B. Sheaves shall be machined from Nylatron or ASTM A48-83 Class 30 gray iron castings having a minimum tensile strength of 30,000 PSI and a Brinell Hardness of at least 187. Sheaves shall have an outside diameter of at least eight (8) in. and shall be lathe turned and grooved for lift line diameters as shown in the Drawings.

C. Hubs shall be minimum two (2) inch diameter, machine faced, bored for and press-fitted with double sealed precision ball bearing assemblies.

D. Shafts shall be minimum 1/2 inch diameter cold finished steel shafting. One end shall be locked to the side plate by a keeper pin; the other end shall be threaded and drilled for a castellated lock nut and cotter pin. A locking nut shall also be acceptable.

E. Side plates shall be minimum 12-gauge cold rolled steel plate. Side plates shall be attached by at least six (6) minimum 5/16 inch bolts through un-grooved pipe spacers sized to space side plates for proper sheave clearance.

F. Blocks shall include a minimum of three spacers between side plates to prevent rope from escaping the sheave.

G. Attachment, location, and quantity as shown in the Drawings plus 8 blocks.

2.21 BELAYING PINS

A. Hardwood pin, 21” long by 1-5/32” diameter.

B. Approved Equipment: JR Clancy 015-249.

C. Quantity: 16 pins.

2.22 COUNTERWEIGHT

A. Front loading counterweight shall be first quality mild steel bar stock. An opening on one end of the counterweigh shall serve as a handle. All edges shall be ground free of burrs and rough or sharp edges.

B. Weights shall be six (6) inches in width. Contractor shall provide weights in two thicknesses that correspond to approximately 30 pounds and 15 pounds.

C. Provide balance weight for all linesets using primarily 30-pound weights. Balance weights shall be painted red and seized to the arbor bottom with two bands of standard mechanically locked steel strapping. On the front face of the top dead weight, paint the set number in white, using stenciled numerals not less than 1/2" high.

D. After balancing, provide additional weight equal to 60% of the total arbor capacity of all installed linesets. Additional weight shall consist of the following percentages, by weight:

1. 30 pound: 75%
2. 15 pound: 25%

E. Additional weight shall be delivered to the Loading Gallery.

2.23 MOTORIZED RIGGING COMPONENTS

A. All motors, hoisting cables, chain, sheaves, hardware, etc., shall be rated for overhead lifting; capable of supporting design loads as shown and shall be of, or treated with, corrosion resistant materials.

B. Motors

1. General

a. All motors shall be properly sized for the application and not more than 1.25 times the combined live load and dead load at the specified speed.
b. Motors shall be totally enclosed and fan cooled.
c. Except as otherwise specified, all motors shall have minimum Class A winding insulation in accordance with current NEMA Standard MG 1-12.40 rated for 15 to 20 minute intermittent duty cycle.
d. All motors shall be equipped with sealed bearings.
e. Conduit connection box shall be watertight, of cast iron, aluminum, or wrought iron construction, with neoprene gasket. A tapped hole shall be provided for conduit entrance and connection box shall be oriented and coordinated with associated equipment to provide full access to internal connections. Corrosion resistant, high melting point, non-flammable sealing compound shall be used around motor leads where they pass through the motor frame.

2. AC Motors

a. All AC motors shall be squirrel-cage type, of NEMA torque design B, with medium starting torque, normal breakdown torque, low slip, and low starting current.
b. All AC motors shall be TEFC (totally enclosed, fan cooled) enclosures as defined by NEMA Standard MG 1-12.21.

3. DC Motors

a. DC motors shall be variable speed TENV (totally enclosed, non-ventilated) and designed for continuous duty cycle.
b. Units shall be equipped with integral tachometer units for speed regulation feedback to the associated drive electronics. Use of armature voltage feedback for speed regulation shall not be permitted. Tachometer output shall be coordinated with the drive amplifier provided.
c. Units shall incorporate an internally mounted winding thermostat to monitor winding temperature. This thermostat shall interrupt the control circuitry to the associated drive in such a fashion so as to prevent operation when safe operating temperatures are exceeded within the motor.
d. Units shall have class H+ insulation on armature and field windings and shall conform to a class F maximum temperature rise curve. All DC motors shall be specifically designed for operation in conjunction with controlled phase rectified power amplifiers.
e. DC motors shall be selected with sufficient de-rating and regard for field heating due to site environmental conditions.

4. For all fixed speed winches, the gear reducer shall incorporate a high inertia flywheel at the motor stage for "soft start" and "soft stop" capability.

C. Gear Reducers

1. General

a. The output shaft shall be supported by two tapered roller bearings. The gears shall run in an oil bath. The shaft bearings shall be provided with double lip oil seals to prevent leakage.
b. Two (2) removable, threaded lubrication plugs shall be furnished for each gearbox. Upper plug opening shall be for lubricant entrance, and lower plug opening shall permit simultaneous purging of spent lubricant from the bearing.
c. Provide a drain plug in the bottom of the frame on the bearing brackets so as to permit periodic drainage of any possible accumulation of moisture.
d. Provide full drip pan under motor and reducer assembly.

2. Right Angle and Helical Bevels

a. Each right angle bevel or spiral bevel gear drive shall be selected to transmit twice required torque, horsepower, and impact. All ratings shall be AGMA mechanical ratings for load classification service factor equal to 2.0, except as otherwise noted.
b. Each right angle bevel gear drive unit shall consist of the following:
c. One housing made of high tensile nickel cast iron, properly reinforced at all strain points for maximum rigidity, with precisely located gear set bearing supports. Each housing shall have sufficient capacity for lubricant, and surface area for adequate heat dissipation.

1. Pinions, gears, and gear shafts manufactured from chromium, molybdenum alloy steel (AISI C-4150) and heat-treated to 32 Rockwell "C" scale minimum core hardness.
2. Pinion and gear shafts supported by tapered roller or precision ball bearings of adequate capacity, properly mounted, and furnished with oil seals.
3. All shaft diameters precisely ground, stepped, and radiused to minimize stress concentrations.

3. Helical Worm

a. Gear reducers shall be combination helical-worm reducer, directly flange-mounted to the motor/brake assembly. The reducer shall have two (2) gear stages; the first stage shall be helical and the second stage shall consist of a worm and worm wheel. The worm shaft shall be milled, hardened, and ground to insure maximum efficiency and long life.
b. Gear reducers shall be enclosed in high-strength gray cast iron housings with precisely located gear set bearing supports. Each housing shall have sufficient capacity for lubricant, and surface area for adequate heat dissipation.
c. Gear reducer shall incorporate a high inertia flywheel at the motor stage for "soft start" and "soft stop" capability.
d. Gear reducers shall be SEW-Eurodrive "Helical-Worm Gear", or approved equal.
e. Gear reducers shall be of the worm gear type with compound helical bevel to single envelopment worm or double enveloping worm gears. Single stage 'Spirol' gearing is not acceptable equipment provided for the Work of this Specification.
f. Worm gear reducers shall be selected to safely transmit specified torque and horsepower. Capacity and type shall be as required. Design of the power transmission train shall provide for gearing ratios of the worm gear stage to be greater than 40:1 wherever practical. Ratios less than 40:1 shall require approval of the Architect's Consultant. All ratings shall be AGMA Class 2 mechanical ratings with a load classification service factor equal to 1.3, except as otherwise noted or approved.
g. Each worm gear reducer shall consist of essentially the following:

1. One housing made of high tensile nickel cast iron, properly reinforced at all strain points for maximum rigidity, with precisely located gear set bearing supports. Each housing shall have sufficient capacity for lubricant, and surface area for adequate heat dissipation.
2. Worm gears manufactured from gear bronze with minimum tensile strength of 40,000 PSI and properly keyed or splined to the gear shaft. Gear shafts shall be manufactured from chromium, molybdenum alloy steel (AISI C-4150).
3. Worm and worm shaft manufactured from chromium, molybdenum alloy steel (AISI C-4150) and heat- treated to 32 Rockwell "C" scale minimum core hardness.
4. Each worm gear and shaft supported by two (2) tapered roller bearings of adequate capacity, properly mounted, and furnished with oil seals.
5. All shaft diameters precisely ground, stepped, and radiused to minimize stress concentrations.

D. Primary Brake

1. Automatic power failure braking shall provide fail-safe stopping in the event of power loss.
2. Except where indicated otherwise, all brakes shall operate from single-phase AC, and shall be electrically released/spring applied, designed to conform to applicable NEMA standards for intermittent duty. All brakes shall be furnished with means for manual release.
3. Brakes shall have drip-tight NEMA type 2 enclosures.
4. All brakes shall stop and hold a minimum of 200% of motor full torque capacity.
5. Any required brake conditioning (for example burn-in) shall be completed prior to system commissioning.
6. Brake noise shall comply with the noise requirement as outlined in this specification.

E. Secondary brakes

1. All motors shall incorporate one of the secondary brake methods described below.

a. Centrifugal overspeed

1. Brakes shall be a fully mechanical overspeed brakes, directly mounted to the drum shaft or sprocket drive shaft.
2. The overspeed brake shall engage automatically when the set exceeds the maximum specified speed by 10%.
3. It shall be possible to preset the brake tension to adjust the stopping distance, so that it brings the load to a controlled stop without shock.
4. The secondary brake shall stop and hold 200% of the full load torque.

b. Drive-through brakes

1. The brake shall be a continuously applied, automatic load brake with a retarding torque matching the load on the hoist.
2. The brake shall be selected and designed to accommodate the heat produced during normal operation without undue wear.

c. Redundant gear/motor/brake assemblies

1. When redundant gear/motor/brake assemblies are used as the secondary braking mechanism, at least two assemblies shall be required to move to the load, while any one shall be able to stop and hold the full torque load.
2. The gear/motor/brake assemblies shall be located on the extents of the drive train so that either gear/motor/brake can stop and hold the full load.
3. The brakes shall engage automatically when the load exceeds the maximum specified speed by 10%, E-stop is engaged or the control system detects a fault.

2. A redundant motor brake on a single motor shaft shall not be used as a secondary brake.
3. The secondary brake shall not apply more than 300% of the full load torque to the system.
4. Any required brake conditioning (for example burn-in) shall be completed prior to system commissioning.
5. Brake noise shall comply with the noise requirement as outlined in this specification.

F. Frames & Guards

1. All motors and associated gearboxes shall be installed on built-up frames, which contain all elements of the lifting system. Frames shall be securely attached to structure.
2. All motor units shall have durable, leak-proof drip pans to contain leakage of oil from motor, gearbox and/or pillow blocks.
3. All exposed moving equipment, devices, and ropes within 7 feet of a working surface shall be guarded in a manner to prevent accidental contact with other machinery, devices, lines, or personnel. Guards shall not impede the operation of the protected device or adjacent devices.

a. Sheaves, drums, shaft assemblies, and ropes moving at the lineset load speed on a hoist limited to no greater than 30 feet per minute and located at the gridiron(s), attic, rigging pit, and catwalks may not require this guarding if both the following conditions are met:

1. “Authorized Personnel Only” signage is provided at access points to these areas, per the Drawings.
2. Clearances are provided around the equipment such that people need not contact components to access any part of the gridiron/catwalk.

b. Guard construction shall be sufficient to resist incidental impact without deforming. When located underfoot, guards shall be capable of supporting a 310 pound person.

1. Guard material for custom assemblies shall be open metal mesh with openings not to exceed 1/2 in. unless otherwise noted in the Drawings.
2. Shrouds for packaged hoists, as engineered by the hoist manufacturer, may act as guards, provided all other provisions of this Section are met.
3. Guards for curtain machines may be sheet metal, provided all other provisions of this Section are met.

c. Guards shall be removable for maintenance.
d. Guard construction and attachment shall not produce additional noise when the motor is in operation.
e. Guard construction must be designed so as to not impede cooling.

G. Grooved Wire Rope Drums

1. Drums shall be grooved welded steel, properly annealed. Minimum tread diameter shall be at least 30 times the diameter of the wire rope employed.
2. Drums shall have integral hubs with properly sized shafts for the transmission of loads and torque. Drums shall be connected to the hub using a key to prevent relative rotation. All driving hubs must have a minimum of two set screws.
3. All wire rope drums shall have sufficient capacity in a single layer for maximum travel plus a minimum of three (3) dead wraps for each wire rope connection. One (1) hole shall be drilled through the root of the groove for each rope end. This hole shall have an axis which, in section, is angled 45° from a radial line drawn from the shaft to the center of the hole. Hole shall be chamfered, free of burrs, and of correct size to retain stop sleeve cable retainer.
4. Drums shall be grooved for wire rope and sized as noted in Drawings. Grooves shall be lathe turned and machined to the proper size for the rope used, with groove diameters sized to fit rope closely and prevent rope from assuming an oval or elliptical shape under load. Groove diameter shall be no greater than 10% larger than rope diameter for ropes smaller than 3/8 in. diameter, and 8% larger for ropes 3/8 in. diameter and larger. Minimum groove depth shall be 40% of the rope diameter.
5. Steel rod or pipe keepers shall be provided to prevent cable from jumping out of grooves. These elements shall be located so that they do not bear on the cable when the cable is correctly seated in the groove.
6. Fleet angles shall not exceed ± 2°.
7. Shafts through drums shall be supported on both ends by bearing blocks to minimize bending stresses in the shaft. Drum blocks shall utilize self-aligning, four-bolt, flange-mount style, cast iron housings with ball bearings, equal to Peer UCF-200 series. Multi-line drum blocks shall utilize self-aligning, two-bolt, pillow block style, cast iron housings with tapered roller bearings, equal to Peer UC 00 series. Each bearing shall be selected to support at least three (3) times the total load of the respective drum.

H. Pileup/Yo-Yo drums

1. Pileup drums shall confine the lift lines to individual winding chambers so that the lifting media winds in concentric layers upon itself.
2. Drums shall be constructed of cold rolled steel. Minimum tread diameter shall be at least 36 times the diameter of the wire rope or 28 times the thickness of the strap used.
3. All drums shall have sufficient chamber depth for maximum travel plus a minimum of three (3) dead wraps. The rope or strap shall be securely seized to the drum in a manner that maintains the full specified capacity of the drum inclusive of applicable safety factors as noted in this Section.

4. Chamber clearance shall be between 5 - 8% of rope diameter or strap width.
5. Fleet angles shall not exceed ± 1.5°.
6. Drum shafts shall be supported on both ends by bearing blocks to minimize bending stresses in the shaft. Blocks shall utilize self-aligning, flange-mount style, cast iron housings with ball bearings. Each bearing shall be selected to support at least three (3) times the total load of the respective drum.

I. Shafts, Keys and Couplings

1. All shafting shall be designed and proportioned in accordance with the "Code for Design of Transmission Shafting" of the ANSI to safely transmit all applied loads and torques and their combinations with proper allowance for impact.
2. All shafting shall be designed to satisfy critical speed and torsional deflection criteria.
3. All shafting shall be of AISI C-1018 steel minimum, unless otherwise specified.
4. All keys and keyways shall be designed to safely transmit all applied loads and shall be proportioned according to ANSI standards.
5. All stepped down shaft corners shall be properly radiused.
6. Shaft couplings shall maintain the proper alignment and load rating of the shaft. System design shall employ the fewest number of couplings possible.

J. Traction Blocks

1. A V-grooved sheave shall be designed to drive lift lines in a motorized application. The sheave shall be designed to minimize wire rope slippage and abrasion during operation.
2. Sheaves shall be connected to properly sized shafts for the transmission of loads and torque, using a key to prevent relative rotation. A minimum of two set screws shall secure the key.
3. The traction block shall hold the load without slippage in a static condition.
4. The traction block shall be rated for the loads and capacities as shown in the Drawings.

K. Chain Drive Components

1. Chain drives shall be used only with motor-assisted counterweighted loads. Design schemes employing chain transmission of power are not acceptable for any 'dead-lift' applications. Any other applications must be specifically approved by the Architect’s Consultant.
2. All chain transmissions shall be ANSI standard double-strand roller chain (minimum), selected to safely transmit the required torque, horsepower, and impact.
3. Unless otherwise noted, all roller chain up to and including 3/4 inch pitch shall be riveted type, and all sizes 1 inch pitch and greater shall be detachable type with cotter pins. Use proper mounting links and attachments to connect roller chains to each other and to the driven object. Terminations shall be bolted with a minimum of two (2) high strength bolts and locking nuts at each termination. The strength of all connections shall be equal to the strength of the roller chain.
4. Sprockets shall be machined from steel plate. All sprocket teeth shall be accurately cut to ANSI dimensional standards. Bore diameters shall be held to proper tolerances to prevent side-weave, run-out, and eccentricity. The hub diameter shall be at least 1.7 times the bore size.
5. Large steel sprockets shall be manufactured by inserting a steel hub into a steel plate sprocket. Steel hub and sprocket contact surfaces shall be accurately machined before welding. Welds shall be continuous and shall have strength equal to the sprocket shear area at the hub diameter.
6. Sprocket pitch diameter as indicated in the Drawings.
7. Sprockets shall be keyed to shafts.

8. All chain drive systems shall be accurately aligned with sprockets, spaced at a proper center distance, and closely supported by approved tapered roller bearings. Provide means for appropriate bearing lubrication
9. Chain tensioning devices must be provided as required maintain appropriate chain tension. Tensioning devices must be field-adjustable and must be installed so as to not impede operation of device or adjacent devices.
10. Guides shall be provided to maintain full engagement of the chain on all sprockets.

L. Electrical Enclosures and Panels

1. Recessed panels shall be contained within code gauge, formed, and welded, steel back boxes or rack mount style enclosures. The operating panels shall be minimum 16-gauge steel or 6061-T6 aluminum plate, recessed within the back box to a depth sufficient to permit a locking hinged door to completely cover the panel without affecting any device within the enclosure. The front surface of the cabinet cover shall be flush with the finished wall surface.
2. Surface mounted enclosures shall be code gauge steel back boxes, with all seams and joints continuously welded and ground smooth. Surface mounted cabinets shall conform to NEMA ICS 6-1993 R200, Type 3; type shall be appropriate to the location. Operating panel shall be mounted per the drawings, on the front cover of the enclosure or recessed within the back box to a depth sufficient to permit a locking hinged door to completely cover the panel without affecting any device.
3. Rack mounted panels shall be contained within a NRTL-listed rack. Surface mounted cabinets shall conform to NEMA standards. The operating panels shall be minimum 16-gauge steel or 6061-T6 aluminum plate, recessed within the rack to a depth sufficient to permit a locking hinged door to completely cover the panel without affecting any device within the enclosure.
4. Internal components shall be protected by a locking mechanism to prevent unauthorized access. An integral device shall be provided to hold the operating panel open for service. Complete accessibility to internal components shall be provided when opened. Internal bracing shall be provided where required by panel size to prevent flexing of the panels.
5. All steel shall be zinc-phosphate treated, primed with a coat of zinc chromate, and finish painted with baked enamel. All aluminum panels shall be anodized and then be painted with a thermo setting epoxy paint. All finish colors shall be as selected by the Architect's Consultant.
6. All labels and legends shall be permanently engraved directly into the faceplate. Engravings shall be filled with contrasting color enamel. Micarta, lamicoid, and other types of engraved plastic labels shall not be used unless permanently, mechanically attached. Dry transfer, decals, plastic "Dymo," or other types of adhesive labels or silk screened legends shall not be used.
7. All control panel faceplates shall have beveled edges and rounded corners.
8. Panel(s) shall have a nameplate in a conspicuous location identifying the Rigging Contractor, Project and Panel Designation.
9. Each panel shall be completely factory-wired internally, with permanently identified barrier type terminal strips provided for the connection of the external wiring. All panels shall be factory tested.

M. Motor control cabinets

1. Cabinet(s) shall be of steel framed construction with applied steel side, top and bottom panels, equal to a NEMA Type 3 rating. All components shall be factory primed and painted.
2. Cabinet(s) shall have a locking front door with an integral safety-interlock, which when the door is opened shall automatically disable the main electrical feed to the panel.
3. Cabinet(s) shall contain all motor control system electronics, starters, and power.

4. All wires inside the cabinet(s) shall be identified at the jacket with separate numbers.
5. An engraved Lamicoid label shall be bolted or riveted to the front of each cabinet, to read:

(Name of Venue)
(Name of Rigging Motor Control Cabinet)
(Axis Name #1)
(Axis Name #2)
(Etc.)

Schuler Shook Theatre Planners, Dallas, TX
(Name, Location and Phone Number of Rigging Contractor)
(Year of Commissioning)

6. Install where shown in the Drawings.

N. Limit Switches

1. All linear motion monitoring switches shall be furnished with rotary lever arm, cam, or plunger style operators. All adjustable linear motion monitoring limit switches shall include sufficient liquid-tight, flexible conduit and wire including grounding conductor, to permit at least 10 ft. of movement for adjustment.
2. All rotary motion monitoring limit switches shall have a minimum NEMA Type 12 or IP65 rated surface mounted enclosure with provisions for conduit fitting mounting. Each limit switch shall employ a lead screw or gear driven, ball bearing supported camshaft and associated precision, snap-action type contact assemblies. Each circuit shall be actuated by an individually adjustable cam operator.
3. All intermediate position limit switches shall provide accurate positioning regardless of direction of travel. See Drawings for intermediate preset positions.
4. All motor-operated equipment shall be equipped with normal travel limit switches to stop motion at each end of travel and redundant over-travel limits which shall remove power from the motor when actuated at each over-travel limit of travel. All over-travel limit switches, when struck, shall de-energize the corresponding motor, and all other affected motors until the assembly is manually reset. Bypass and reset over-travel limits shall be limited to authorized, trained personnel; bypass and reset shall not be possible from a user control panel.
5. All limit switches shall be located so as to be easily accessible following installation for adjustment and observation.
6. Exact limit settings will be verified in the field during commissioning.

O. Encoders shall be used to provide position and speed data for all permanently installed motorized rigging sets with programmable presets or positional feedback, as indicated in the Drawings. These encoders shall be capable of retaining position data during emergency stop and normal power down events.

P. Safety and Protective Devices

1. Slack line detection shall be provided for each lift line by means of a low-voltage detecting device. Lift line contact with this detector shall signal a slack condition to the control system. This requirement does not apply to fire curtain systems.
2. Interlocks

   a. Shear Protection. All shear conditions shall be protected by full-length, continuous pressure tube, astragal tape, or other fail-safe pressure sensitive shear point guards as approved by the Architect's Consultant.
   b. Access Management. All locations and access points indicated in the Drawings shall be protected by safety switches or door interlocks. All of these protection devices shall

interlock in their respective "safe" positions before any motion can be initiated. All interlocks shall remain in their respective "safe" positions for motion to continue. Temporary or permanent tripping of any interlock to an "unsafe" position while axis is in motion shall stop the axis and require manual resetting.

1. Where indicated, door interlocks shall disable the door from being opened when engaged. Keyed bypass switches shall be provided outside the area to override the interlock. An emergency bypass switch shall be on the inside of the area. The emergency switch shall stop motion in the axis.
2. Safety switches and interlocks on guards shall have a means of bypass for system maintenance. This bypass shall be limited to authorized personnel.

2.24 ELECTRICAL CABLE MANAGEMENT

A. Rigging Contractor shall coordinate the installation of electrical cable management assemblies with Division 26, Section 11 61 13, and Section 11 61 63.

B. Pantograph

1. The pantograph shall provide permanent electrical connections for circuits as shown in the Drawings.
2. The pantograph assembly shall consist of extruded aluminum wire way segments joined by robust hinged connections.
3. Assembly shall operate without causing lateral movement of the associated rigging element.
4. Hinges shall be sized to maintain the required electrical cable bending radius while not damaging the cable.
5. Segments shall be sized in cross section to carry the required quantity and size of power and data cables with internal voltage barriers as required.
6. The length of each segment shall be based on the distance between rigging pick up cables and maximum actual travel to minimize the total number of segments.
7. The assembly shall have an electrostatic paint finish in black.
8. Festoon cable for non-data wiring shall be annealed stranded bare copper insulated with flame-retardant Polyvinyl Chloride (PVC) and provided in the required number of conductors and wire sizes per Division 26.
9. Data wiring shall comply with requirements as outlined in Section 11 61 63 and shall be able to meet the bending requirements imposed on it by this assembly.
10. Units shall contain electrically insulated, adjustable strain relief devices to hold all cable securely in place.
11. The pantograph shall be installed between rigging lift lines and in such as way as to prevent electrical cables from fouling with other hoisting components or mechanism.
12. Unit shall be securely mounted to the supporting structure and associated rigging element in a manner that minimizes segment deflection and cable stress.
13. A horizontal movement compensation trolley track shall be provided.

    a. One (1) trolley and mounting bracket shall be provided to attach extruded aluminum wire way segment to track.
    b. One (1) trolley and bracket shall be provided to manage excess cable between segments and electrical connection point.
    c. Two (2) end stop plates to be provided to prevent the trolley from exiting the track.

14. Warranty shall be for a minimum of three (3) years
15. Approved Manufacturers:

a. J. R. Clancy
b. SSRC
c. Approved Equal

16. Quantity: As shown on drawings.

C. Cable pick with cable cradle

1. Approved multi-conductor flexible cable type between fixed power and data sources and moving theatrical elements shall be furnished by Section 11 61 63 unless otherwise noted. Moving theatrical elements shall include:

   a. Stage electric battens

   b. Drop Boxes

2. Provide cable cradles, all lifting cables, fiber rope, loft blocks, cable drums, etc. for support and movement of multi-conductor flexible cable providing power and/or data to moving theatrical elements.
3. Cable cradles shall be constructed of fabricated steel, with grooves and clamps sized to the number and diameter of multi-conductor cables.
4. Cable cradles shall be so designed that when installed, the assembly hangs plumb and true. When installed, the cable pick with cradle shall not obstruct the movement of any adjacent rigging elements.
5. Unless indicated on the drawings, each cable cradle assembly shall support no more than three cables with each cable resting in a dedicated cradle. When an assembly is supporting more than one cable, the cradles shall stack vertically, not horizontally.
6. This Section shall install all multi-conductor flexible cable and hardware furnished by Section 11 61 63.

   a. Power and data cables shall hang freely for seven days prior to electrical terminations to allow for cable to relax.

7. Where data is required in addition to power, the data cable shall be mechanically attached to the exterior of the power cable every 24 inches with nylon cable ties. Ends of cable ties shall be trimmed after installation.
8. Electrical power connections shall be provided by Division 26. Data connections shall be by Section 11 61 63.

2.25 MOTORIZED “PACKAGED” HOISTS

A. General

1. Single, self-contained hoist modules shall be used for each motorized batten location. Hoist assemblies shall be a compact design with all required components integrated in its structure, including cable drum, winch, gearmotor, and brake.
2. All moving elements shall be properly guarded and enclosed to prevent injury and to protect from contact with contaminants. This enclosure should also help reduce acoustical noise from the motor and moving components.
3. The assembly shall mount vertically to I-beam flanges on 10’ centers. All mounting equipment shall be adjustable to actual field conditions.
4. All motors, hoisting cables, chain, sheaves, hardware, etc., shall be rated for overhead lifting; capable of supporting design loads as shown, with minimum safety factor of eight (8) and shall be of, or treated with, corrosion resistant materials.

5. Each hoist shall have the capacity to raise and lower the specified loads at the specified speeds for the full range of travel, as shown in the Drawings.
6. The hoist assembly shall permit 5 lift lines to support a scenery batten on 10' centers with 30' of travel.
7. Each hoist assembly shall have an affixed, engraved name plate. The name plate shall include the following information: hoist number, lifting capacity, sustaining capacity, incoming power source (including voltage, panel number, circuit numbers and panel location), and manufacturer's name and 24 hour service phone number.

B. Drums and sheaves

1. The cable drum shall move along its axis to maintain a zero-fleet angle between cable take-off points on the drum and muling sheaves within the assembly throughout the range of operation.
2. The helically grooved cable drums shall be designed to properly support the required loads without crushing or deformation. Drums shall carry only one layer of cable. Cables shall terminate through a properly angled, smooth hole in the drum, sized to retain a Nicopress sleeve. Cable clips are not acceptable.

C. Systems with multiple wire rope drums which do not have a 1:1 ratio with an intermediate load brake, or systems incorporating intermediate universal joints, differentials, or couplings, shall not be allowed.

D. All sheaves shall meet provisions given elsewhere in this specification.

E. Encoders and limit switches

1. Encoders and limit switches shall be utilized to limit travel to upper and lower positions. Switches operate in conjunction with motor starter relays. Each hoist shall have four (4) limit settings: ultimate high; ultimate low; normal high; normal low.
2. Positively driven mechanical limit switches or solid state encoders shall be provided for normal limit indication.
3. Ultimate limit switches shall be backup, positively driven mechanical limit switches set to operate before any object being raised or lowered is stopped prior to damaging the object being hoisted due to a collision with permanent structure above or below the hoisted object. All ultimate limit switches, when struck, shall de-energize the corresponding motor, and all other motors in the group (no movement in ANY direction) until a special maintenance procedure is activated. Verify exact limit locations in field.

F. Electrical

1. Each motor shall have its starter assembly, circuit protection local to the motor assembly. As an alternative, the Contractor may provide a central motor control cabinet (MCC) on the stage left rigging wall. Coordinate MCC placement with other trades and devices.
2. Starter assemblies shall include a safety line contactor, incoming power fuses, control transformer with fuses, all related safety relays and terminal blocks.
3. Every motorized hoist control shall have circuit protection.
4. The MCC, if present, shall be fed all power necessary for motorized hoists and control from a power distribution panel by Division 26.
5. All internal wiring in the MCC shall be completed and tested at the factory before delivery to the job site.
6. Cabinet shall be a NEMA rated enclosure.
7. All electronic components shall be sized at 200% of nominal capacity.
8. The input high-voltage power available shall be 120/208 VAC, 50/60 Hz Three Phase. Any modifications to this power are the responsibility of the hoist manufacturer.

9. All electrical work from and including the buss system and the motor control cabinet (if present), including high and low voltage wire, terminations, and conduit, is the responsibility of the Division 11 contractor. Conduit from the low voltage buss to the motor control panel shall be by Division 26.
10. High voltage and low voltage power shall be terminated in separate buss systems, with one high voltage and one low voltage receptacle for each hoist assembly. These receptacles shall be spaced in the raceway such that they are located horizontally within 2" of the center of the corresponding hoist centerline. Each high voltage receptacle shall have local circuit protection.
11. Both high and low voltage buss systems shall be factory-built and tested for the application before delivery to the job site.
12. Each hoist assembly shall be have safety twist-locking connectors for power and control connections to the raceway.
13. Each hoist shall have over-current and ground fault circuit protection located at the raceway.
14. In the event that a loss of communication occurs during a move, the hoist shall immediately come to a controlled stop.
15. All electrical installations must meet or exceed the latest version of all applicable standards and wiring and safety codes.

G. Motor Controllers:

1. For fire and electrical safety, motor controllers shall conform to the NEC, be built in accordance with UL Standard 508, and be "touch safe" per IEC 204-1 "Protection against direct contact" rules.
2. Controllers shall be wired so that operation of the normal end of travel limit switches shall only allow movement away from the limit switch.
3. Variable speed controllers shall be solid state flux vector controllers designed for hoisting duty. Each controller shall incorporate closed loop feedback using a solid state position encoder mounted on the motor shaft to provide the greatest accuracy and performance. The controller shall provide an essentially infinite speed range, including the ability to produce full torque at zero speed. The use of open loop drives is prohibited.
4. Controllers shall provide under voltage, over voltage, instantaneous over current, overload, and phase loss protection.
5. Operation of the key switch shall disconnect power to all starters and drives.

H. Emergency Stop System

1. The E-stop and overtravel limit switches shall be part of a circuit which is separate from and redundant to the normal end of travel limit switches. This circuit shall not depend on software or electronic logic. When activated, the Emergency-Stop shall halt all motor movement and remove power to the motors by separate line contactors using a UL580E Type 2, non-welding, positive break contactor. An override mechanism to allow resetting of the overtravel limits shall be included.
2. For winches running at more than 50 fpm, a Category 1 controlled (ramped) stop is required, with removal of power when a stop is achieved after a predetermined interval not greater than 1 second.
3. The E-stop loop shall be continuous and wired such that the depression of any E-stop switch disconnects power from system. Power cannot be restored until all E-stop buttons have been released.
4. All E-stop switches shall be of the self-latching, mushroom type. The button shall easily activate the control system with a push to activate/turn to release action. The switches shall be red and clearly labeled "EMERGENCY STOP" in white letters.
5. Hard-wired E-Stop switches shall be located on the motor control panel stage left, on the stage right wall at the Stage Manager's Panel, and in the booth.

I. Hoist shall have the following performance requirements in addition to those listed above:

1. Stopping distance of one-half inch (1/2") at full load at full speed under normal operation
2. Preset targets and limit settings to 1/8” accuracy.
3. Speed regulation within 5% at full load

J. Installation and commissioning of the motorized rigging system shall be performed by a factory authorized and trained technician.

2.26 MOTORIZED HOIST CONTROL

A. Control System Functions

1. The control system shall be specifically designed for the control of motorized theatrical rigging equipment. It shall provide a level of reliability, accuracy, and integrity appropriate for overhead lifting in places of public assembly.
2. The system shall be capable of controlling all specified hoists but shall not allow more than four hoists to operate simultaneously. Programmed play positions trims shall be stored in non-volatile memory.
3. The control system shall perform the functions as noted for specific elements below. This list of functional requirements describes the minimum operating parameters of the systems.

a. Stage Electrics

1. Operator authorization levels to ensure secure access levels and lockout levels of operation and control as noted in this Section.
2. Axis grouping allowing multiple axes to operate simultaneously with different target positions.
3. Programmability of target position and group.
4. Indication of position. All position data to be acquired from positional encoders specific to each axis.

b. Orchestra Ceilings (to accommodate future ceilings)

1. Operator authorization levels to ensure secure access levels and lockout levels of operation and control as noted in this Section.
2. Axis grouping allowing multiple axes to operate simultaneously with different target positions.
3. Programmability of target position and group.
4. Indication of position. All position data to be acquired from positional encoders specific to each axis.

B. Fixed Speed Starters

1. Each hoist shall include a fixed speed reversing starter. Starter assemblies shall be located in a single cabinet on the gridiron. Starter assemblies shall include a safety line contactor, reversing contactor sized for plugging and jogging, incoming power fuses, control transformer with fuses, all related safety relays and terminal blocks.

C. Emergency Stop

1. The emergency stop system shall meet NFPA-79 (Electrical Standard for Industrial Machinery)

2. The emergency stop circuit shall be a normally closed circuit or a supervised circuit that provides the same or greater level of reliability and security. Its operation shall not depend on software or semiconductors.
3. Emergency Stop. There shall be a single emergency stop system that shall, when activated, stop all elements as shown in the Drawings.

    a. Emergency stop actuators shall be rear-illuminated mushroom pushbutton switches. Operation shall be PUSH to engage and TWIST to release. Color: red.

4. Machine Stop. There shall be “machine-stop” buttons that shall, when activated, stop all elements as shown in the Drawings.

    a. Machine stop actuators shall be rear-illuminated pushbutton switches. Operation shall be PUSH to engage and TWIST to release. Color: Yellow.

5. Both systems shall function as noted below.

    a. Category 0: Activation shall directly remove power by means of electromechanical components, using a UL580E Type 2, non-welding, positive break contactor(s).
    b. Category 1: A controlled stop per NFPA-79 (Electrical Standards for Industrial Machinery) shall be provided. The system shall stop all motors and remove power in not less than 0.75 seconds.
    c. Engagement of the system shall remove power from the motors, but not the control system electronics.
    d. Feedback

        1. When activated all pushbuttons described in this paragraph shall be illuminated and shall flash to indicate a “STOP” condition. Buttons shall continue to flash until system has been taken out of “STOP” condition.
        2. The system shall provide visual feedback on the motor control panel as to the specific control location that has initiated the “STOP” condition.

    e. When the system is taken out of the “STOP” condition no movement shall begin automatically.

6. Panel design and location as shown in the Drawings.
7. E-stops shall be located in all control panels, on the stage right/left wall, at the motor control center, and at the loading gallery level.

D. Software

1. Motor Control

    a. The system shall provide a controller; preset creation and editing facilities; and a display of the current position and target position of each hoist. A complete display of the status of all axes, faults and interlocks shall be provided.

2. The system shall be capable of the following operating parameters:

    a. Jog - One axis can be selected and operated directly.
    b. Single Target – axes may be simultaneously directed to a common target height.
    c. Absolute Targets – axes can be selected, with individual target heights for each axes, and simultaneously directed to the targets.

d. Relative Target – axes can be simultaneously directed to move a specific distance from their present position.
e. Relative Positioning – axes can be simultaneously directed to move a set distance and maintain their preset spatial relationship to the others in the selection.
f. Quantity of axes in motion: For parameters b through e above the system shall be able to move at least 01 axes but no more than 04 axes simultaneously.

3.
4. Cues and Presets

a. Cues and Presets shall be able to be composed, stored, modified, and recalled to allow recording and re-creation of movements. Individual cues shall have the ability to contain any or all of the following features.

1. Target position –which may be relative or absolute, or to match the present or previous target position.
2. Acceleration – An acceleration time or rate may be selected to provide the desired effect, or the default value may be used.
3. Speed may be selected as a velocity, a percentage of full speed, or as a travel time, in which case the system will calculate the speed required. If no selection is made, the default value will be used.
4. Deceleration - A deceleration time or rate may be selected, independently of the acceleration rate.

b. Multiple hoists: A single cue shall be able to control multiple hoists, each with its own speed and target.
c. Cues shall be able to be named or numbered to suit the user's needs.
d.
e. Presets shall be recorded in a manner similar to cues to provide a defined starting point for the following cues. Cues shall have a sequential relationship with the base preset and preceding and following cues.

5. The system shall monitor and provide feedback on the following system components:

a. Axis position
b. Limit Switch Status
c. Emergency Stop Status
d. Interlock Status
e. Fault condition
f. Electrical supply status
g. Load Sensing.
h. Slack Line Detection

6. The system shall be able to accept control direction from 01 user input device at the same time. This function shall be user-configurable to allow for different levels of axis control.
7. System Hierarchy – The system shall provide the following levels of operational access:

a. System Administrator. User shall be able to modify all operational parameters. This level shall be password protected. The password shall be user-defined at system startup.
b. Supervisor. User shall be able to set targets, speed, write cues, and monitor feedback parameters. This level shall be password protected. The password shall be user-defined at system startup.

c. Operator. User shall be able to jog sets as noted above, execute cues, and monitor feedback parameters. This level shall be password protected. The password shall be user-defined at system startup.
d. Observation Mode. User shall be able to monitor all axes positions and all feedback parameters.
e. Manufacturer Access. Access is password protected and shall be set by the manufacturer and is not user definable. This level of access shall be equal to System Administrator level access.

8. For a period of two (2) years following acceptance, the Rigging Contractor shall provide and install, at no cost to the Owner, all control system upgrades. Thereafter the Rigging Contractor shall notify the Owner of all system upgrades for the life of the control system. The Rigging Contractor shall keep system user's name and address in a database for this purpose. All upgrades shall include a full written description of operational modifications. System upgrades shall be designed so as to allow existing data to be accessed and upgraded.

E. User interface

1. The control system shall be comprised of individual control panels as shown in the Drawings. Each panel may contain one or more of the following control elements:

a. Emergency Stop Button(s) as described in this section.
b. One ON/OFF key switch. Provide five (5) keys. Switch shall not allow removal of key when in the ON position.
c. Movement Controls: One set of two (2) momentary contact switches, labeled with the appropriate directional destination. It shall be necessary to maintain contact on the switch in order to maintain movement. A dedicated DEADMAN switch shall be acceptable as an alternative to push to run switches.
d. Positional Readout: One illuminated digital readout for each winch. Readout shall at all times indicate the axes' location as related to a defined datum point. Readout shall be in feet and inches, accurate to 0.25 in.
e. Set Trim Controls: Controls shall be an illuminated push-button. Controls shall set two (2) intermediate targets between the mechanical upper and lower limits. The location of these intermediate targets shall be as indicated in the dynamic display and shall be selectable within 1/2 in. Button shall flash when the location has been stored in the control software. The user will be required to hold the button for three (3) seconds in order to set the trim position.
f. Selector switch(es): Switch(es) shall allow selection of one or more motor/winch as noted on the Drawings.
g. Visual Feedback Indicators

1. Control Power Status shall indicate when illuminated that the control panel is active and communicating with the control system/software. Color: Green
2. Motor Power Status shall indicate when illuminated that the motor(s) in the system are energized and within the acceptable amperage range. Color: Yellow
3. Axes in Motion/Move Complete shall indicate, by flashing, that any axis is in motion. A steady illumination shall indicate that the axis is no longer in motion. Indicator shall turn off after ten (10) seconds following completion of movement. Color: Amber
4. Interlock faults/Error reporting shall indicate when illuminated that an error condition exists in the system. The indicator shall monitor the following conditions. Color: Red

a) Overtravel
b) Safety and Protective Devices
c) Load Sensor monitoring
d) Slack Line Detection

h. Graphic Display

1. Rear-illuminated display screen shall display information about system as defined by this Specification and the Drawings.
2. Screen size shall be a minimum of 7 in. diagonal for handheld devices and 12 in. diagonal for panel mounted devices.

2. Local Control

a. Provide local motor control in immediate proximity to each individual motor location.
b. Control at motors shall be in NEMA type 1 housings. In addition to pushbuttons for control of stop, up, down and overtravel limit bypass, control stations at motors shall include a three-position switch for delegating control of motor to local-off-normal. All STOP functions, whether local or remote, shall function regardless of the position of the local-off-normal selector switch.

1. Maintenance pendants may be provided for local control functions provided that the connection of a fixed speed style control pendant to a variable speed unit will not result in motion or damage to the connected units or vice versa. Connectors shall equal AMPHENOL MS or 97 series. When a maintenance pendant is plugged in the unit shall automatically switch from Normal to Local mode.

3. Push Button Motor Control Panel (MCP-X)

a. The Motor Control Panel shall be a surface mounted panel and completely wired internally. Design and configuration as shown in the Drawings.
b. The panel shall contain the following:

1. Control Panels as shown in the Drawings
2. Receptacles for Portable Control Devices.

c. Install as shown in the Drawings.

4. Portable Control Devices (PCD-X)

a. The Portable Control Device shall be separate, totally enclosed, portable, and completely wired internally.
b. The face of the panel shall contain the control Panels as shown in the Drawings
c. Design and configuration as shown in the Drawings.
d. The Portable Control Device shall include a vinyl dust cover or case lid as appropriate, and one (1) 30 ft. multi-conductor cable terminating in a locking connector appropriate for mating with Motor Control Panels as required by the Drawings.
e. Panel shall incorporate carrying handles on the left and right sides.
f. Panel shall be mounted to a weighted rolling cart, 36 in. high. Attachment shall allow for un-mounting of panel by the user.

5. Computer Console

a. The following control systems shall be acceptable:

1. Group C – Basic preset systems

a) Vantis pendant controller by JR Clancy
b) Arbor Preset Station by Texas Scenic Company
c) Pioneer I by Texas Scenic Company
d) Quick Touch by ETC
e) Scout remote by Texas Scenic Company (pendant for Pioneer systems)

2. Others as approved….

6. All labels and legends shall be permanently engraved into the face of the panel and filled with a contrasting paint. No surface-mounted labels or tags of any kind will be permitted. No decals or silk-screened legends will be permitted.
7. Provide vinyl dust covers for all equipment components that are not wall-mounted.

F.

G. Safety & Protective Devices

1. Each winch set that employs slack-line detection shall create an Emergency Stop condition when a slack line is detected.
2. Each winch set that employs load sensing shall create an Emergency Stop condition when load thresholds are exceeded. The control system shall monitor the loads on the winches, first learning the characteristics of a new load, then monitoring each move for changes in the load. Load information shall be obtained from solid state load cells.
3. Any interlock in an "unsafe" position shall prevent operation, stop the axis if the axis is in operation, and require manual resetting.
4. Secondary brake systems shall provide feedback to the control system to alert the operator(s) that the brakes have engaged.
5. Add Additional language as required by project requirements….

H. Signage

1. Provide an engraved lamicoid placard at each control panel location.
2. Placard shall include the following information:

a. Name, address, and phone number of stage rigging contractor.
b. Cautionary notice:

CAUTION
HEAVY LOADS OVERHEAD.
DO NOT OPERATE STAGE RIGGING SYSTEM
WITHOUT PROPER TRAINING.

c. Notice regarding the necessity of periodic inspections.

I. All components shall be UL listed and carry UL labels.

J. Install as indicated in the Drawings.

K. Quantities as per schedule.

2.27 MOTORIZED RIGGING CONTROL

A. Control System Functions

1. The system shall be configured for the operating characteristics of each specific motor. Secure such information by access codes.
2. The following programmable system features are available to the user:

    a. English position commands and display
    b. Upper and lower normal limits for each motor.
    c. Relative positioning

3. Move Command options shall be as follows:

    a. Manual moves
    b. Moves to a defined Target
    c. Moves to prerecorded play positions

4. A status key shall be provided for operator inquiries such as play position assignments and motor status.
5. The ability to be operated from multiple control locations with either a wall-mounted and hand-held unit.
6. The ability to record and display positions with a precision of 0.01 feet.
7. The ability to view units as architectural fractions of an inch and feet, decimal feet, and metric.
8. The ability to achieve an accuracy of + 1/8" of target location on normal motor moves.
9. The system shall continually notify operator of system and motor status such as Ultimate Limits, Upper & Lower Normal Limits, Slack Line, Emergency Stop, Motor Not Ready, Local Control, Thermal Overload, etc.

B. The rigging control system shall consist of the following major components

1. A permanent control station contained in a wall-mounted locking cabinet on the stage left wall beside the Stage Manager’s Panel (SMP).
2. A detachable, remote control hand-held unit with a 50’-0” cable.
3. A receptacle mounted at 12” above the floor and adjacent to the permanent control station for connection of the remote-control hand-held device.
4. A receptacle mounted at 12” above the floor and adjacent to the motor control center for connection of the remote-control hand-held device.
5. Required motor control logic and contactors contained in a motor control center mounted on the gridiron as shown on drawings.
6. The remote-control hand-held unit shall have the capability to be plugged into any receptacle station and used in conjunction with, or in place of, the permanent control station. The unit shall be protected by a heavy-duty rubberized case and equipped with 34 function keys in a sealed keypad and a four-line liquid crystal display screen. The handgrip shall incorporate a "liveman" safety that acts as an emergency stop.
7. A mushroom cap Emergency Stop switch shall be provided on the permanent control station. The button shall easily activate the control system with a push to activate/turn to release action. When activated, the Emergency-Stop shall halt all motor movement and remove power to the motors by separate line contactors.
8. The Motor Controller unit provided at each motor shall consist of the following:

    a. One (1) 12-bit D>A Output channel
    b. Two (2) 8-bit A>D Input channels
    c. One (1) Differential Encoder Input

d. One (1) Buffered Differential Encoder Output
e. Twelve (12) Opto-isolated Inputs
f. Five (5) Opto-isolated Outputs
g. Four (4) Relay Outputs
h. Two (2) RS-422 Serial Ports
i. Network LED Status Indicators

C. Approved Equipment:

1. JR Clancy
2. Tait Towers
3. Texas Scenic

2.28 MOTORIZED HOIST CONTROL

A. Control Stations:

1. Control stations shall be wall mounted NEMA 1 enclosures, containing a hold to operate (dead man) Up and Down pushbuttons for each winch. A key operated On / Off switch shall be provided. A red, mushroom head emergency stop pushbutton shall be provided, which directly controls the line contactor in the starter.
2. Panel components (pushbuttons, key switches, switches, indicators, E-stop switches) shall be industrial grade, heavy-duty components with 7/8” (22 mm) operators.

B. Emergency Stop circuit:

1. The emergency stop circuit shall be a hard-wired circuit that does not contain any solid-state components.
2. At a minimum, this shall be a normally closed circuit wired in series through normally closed E-stop switches, and directly controlling the line contactor(s) of the associated motor(s). Emergency stop circuits that interrupt control power to reversing contactors are not acceptable.
3. Other supervised circuits may be considered, but only if they provide a greater level of reliability and security.

C. Control System Components

1. The rigging control system shall consist of the following major components
2. A permanent control station contained in a wall-mounted locking cabinet on the stage right wall beside the Stage Manager’s Panel (SMP).
3. A detachable, remote control hand-held unit with a 50’-0” cable.
4. A receptacle mounted at 12” above the floor and adjacent to the permanent control station for connection of the remote-control hand-held device.
5. A receptacle mounted at 12” above the floor and adjacent to the motor control center for connection of the remote-control hand-held device.
6. Required motor control logic and contactors contained in a motor control center mounted on the gridiron as shown on drawings.

2.29 CURTAIN FABRICS

A. Refer to drawings for new curtain sizes and quantities. All fabrics shall be first quality. All fabrics shall be produced from one dye lot per color. Color quality shall be consistent throughout, with no visible streaking, striping, or spotting.

B. Fabric for Grand Drape and Valance curtains shall be 32-ounce combed velour. Color shall be selected by Architect. Approved fabric manufacturers:

1. KM Fabrics
2. JB Martin

C. Fabric for borders, legs, black out drapes and traveler curtains shall be 25-ounce synthetic velour. Color shall be black. Approved fabric manufacturers:

1. KM Fabrics
2. JB Martin
3. I. Weiss & Sons

D. Fabric for scrim curtains shall be black sharkstooth scrim. Color shall be black. Approved fabric manufacturers:

1. Rose Brand
2. Dazian Fabrics

E. Fabric for cyclorama shall be seamless cotton. Color shall be bleached white. Approved Fabric:

1. Rose Brand Seamless Bleached White Muslin FR
2. Gerriets International Shirting Bleached Muslin

F. Lining. IFR blackout lining fabric, Rose Brand “Avora Lining Plus” or approved equal.

G. Webbing

1. Natural jute upholstery webbing for top of curtains: Dazian 3-1/2" Wide #115062
2. Heavy Weight Polypropylene. 3 inches tall, 1.7 mm thick. Rosebrand “Poly Pro Webbing” or equal. Color: Black.

2.30 STAGE CURTAIN TRACK ACCESSORIES

A. For the purposes of establishing a standard of quality desired, curtain tracks and certain other products of Automatic Devices Company (ADC), 2121 S. Twelfth St., Allentown, PA, (610) 767-6000, have been used in this specification and in the drawings.

B. Refer to Drawings and Rigging Schedule for equipment types, sizes and quantities.

C. Channel Traveler Track Type - Silent Steel 283-R Series Track complete with all necessary accessories for manual rope pull operation. Specific track lengths are shown in the Rigging Schedule. Included equipment:

1. 8“ Floating Sandbag Tension Pulley: ADC No. FSBTP-8.
2. 8” Adjustable Floor Pulley: ADC No. 2866-A
3. 8” Live End Pulley: ADC No. 2863-A
4. 8” Dead End Pulley: ADC No. 2864-A
5. 1/2” Synthetic center pull cord: ADC No. 2830 Cord
6. Single Carriers equipped with neoprene-tired ball bearing wheels: ADC No.2849
7. Master Carriers equipped with neoprene-tired ball bearing wheels ADC No.2850
8. Back-Pack Guide: ADC No.2833-A
9. Rubber Bumpers ADC No. 2825

10. Curtains shall be connected to Carriers by means of a heavy-duty steel self-closing clip at each Carrier which connects the trim chain of each Carrier to grommets located at the top of the curtains. Connection by means of S-Hook or other device requiring tools to open or close shall not be acceptable.
11. Provide walk along version using components listed above. Use model 284-R Walk Along Track System. Add a pull ropes to each curtain panel.

2.31 BOTTOM PIPE FOR CURTAINS

A. Bottom pipe for all curtains shall be 1” Schedule 40 pipe with sleeved splice junction pipes with spring type button connectors to lock sections together. Pipe shall be smooth, without rough spots, burrs, or sharp edges.

B. Bottom pipe to be in 10’-0” lengths with additional shorter lengths as required to properly weight the full curtain width. Bottom pipe shall have holes to accept splice pipe spring button connector.

C. Splice connectors:

1. Inner sleeve splice pipe shall be 3/4” IMC conduit 1’-0” in length, with spring snap buttons installed in sleeve pipe to lock the outer pipe sections together. All bottom pipe sections to be drilled with a 7/16” hole, 2 inches from the end of the pipe to accept the snap button spring connectors of the inner splice pipe. Spring snap button to be Valco B-160, McMaster Carr 94282A270 dog leg style or similar. Spring snap buttons are typically used on telescoping tubing. There shall be one inner splice pipe for each piece of bottom pipe plus 4 extra inner splice pipes complete with snap buttons. IMC conduit shall be smooth, without rough spots, burrs, or sharp edges.

D. Provide bottom pipe for the following:

1. Cyclorama
2. Scrims

E. Quantity: As required to properly weight all curtains.

2.32 CURTAIN HAMPERS

A. Basket fabric shall be heavy duty canvas sewn and riveted to frame. Canvas handles shall be provided at the two (2) ends.

B. Basket frames shall be electro-welded high tensile spring steel.

C. Truck frames shall be hardwood, with four (4) hard rubber heavy duty swivel casters in the four corners.

D. Hinged tops shall be resin laminated plywood with steel corner plates and chain-tethered snaps.

E. "Dandux 40-720" by C. R. Daniels, Inc., Ellicott City, Maryland, or acceptable substitution.

F. Provide a sufficient quantity of 20-bushel hampers for the storage of all stage masking curtains with the exception of the Main Curtain and Valance.

G. Stencil with paint on all hamper lids, "STAGE CURTAINS ONLY."

H. Deliver to Owner.

2.33 OUTRIGGER BATTEN

A. Outrigger batten shall be nominal 1-1/2-inch black steel pipe, ASTM A53/A Strong (Schedule 40), stripped and painted with at least one (1) coat of flat black paint.

B. Batten shall be supported from the T-bar battery ten (10) feet O.C. by brackets made of steel plate.

C. Outrigger batten shall extend the full width of the lock rail and be rigidly fastened at each end.

D. Install as shown in the Drawings.

2.34 INDEX STRIP LIGHT - LED

A. Provide Index Strip Light as shown on drawings. Fixture to be hung by chains as shown on drawings.

B. Fixture shall provide bi-color LED system mounted into a water-jet cut 1.5” I.D. ASTM 53A steel or aluminum pipe. LED colors shall be blue and white.

C. Intensity and color control shall be via remotely mounted wall enclosure with two sliders with LED indicator handles. Faceplate shall be black anodized aluminum laser engraved.

D. Provide all necessary mounting hardware.

E. Acceptable manufacturers:

1. Texas Scenic - Index Striplight
2. Approved equal

F. Locations: Stage level locking rail.

2.35 SYSTEM SIGNAGE

A. Provide placard(s), placed in conspicuous location(s) and as indicated on Drawings, visible from the operating area(s), with information on stage rigging system.

B. Sign shall be screen-printed plastic, permanently secured, filled with contrasting paint, with text as shown in the Drawings.

C. Size and quantity per Drawings.

D. Coordinate mounting location in the field with Architect’s Consultant.

PART 3 EXECUTION

3.01 INSTALLATION, LABOR AND SUPERVISION

A. Employ only fully trained stage riggers, assisted by competent common laborers, for the erection and installation of the stage equipment and related accessories herein specified. Stage Riggers shall be adequately and properly trained in the erection and installation of the style of rigging specified herein. Employ a competent superintendent on the work at all times.

B. Install all items of the stage and auditorium rigging where indicated and completely connect and make operative as specified. Install in accordance with generally accepted theatre industry practices and the following references.

1. USITT Recommended Guidelines for Stage Rigging and Stage Machinery
2. Macwhyte Wire Rope Handbook (published by Macwhyte Wire Rope Company)
3. Rigging Manual (published by the Construction Safety Association)
4. Wire Rope User's Manual (published by American Iron and Steel Institute)

C. Install draperies at scheduled locations. After installation, all curtains and draperies shall be thoroughly brushed to remove all loose dust, visible dirt, fabric lint, loose threads, etc. Wrinkles will be permitted to fall out naturally. All curtains, or draperies, shall hang level and be uniformly in contact with the stage floor along the entire width of the curtain, or drapery.

D. Install cable clips where specified in accordance with manufacturer's installation instructions with correct amount of torque on nuts. After installation, apply a load to each batten and re-check for proper torque on nuts of cable clips.

E. Battens shall be trimmed level to the horizon and parallel to the stage or auditorium floor to a tolerance of ±½ inch over the length of the batten. A batten shall not deviate from true straight installation by more than ±½ inch.

F. Maintain wire rope fleet angles at one and one-half degrees (1½) or less. Install Mule Blocks as required to maintain specified angles. System should run quietly in every respect when operated.

G. Install electrical devices provided under this section for proper hoisting of equipment. Install cable saddles and rigging for plug strips and hanging plug box SO cables. Cable saddles are furnished under other section and installed under this section. Electrical cables shall be installed in such a manner that the entire length of all cables is in a plane parallel to the associated set and so that, except for the terminal, no portion of the cable ever rests on or interferes with the electrical device supplied. Provide support, muling, and turning blocks as required for proper support and movement of the electrical cables and cords.

H. Install counterweight arbors so they may be loaded at the loading gallery when batten is at scheduled low trim.

3.02 FLAMEPROOFING OF FABRICS

A. Fabrics shall comply with all State and local codes and regulations including:

1. IBC 410.3.6 and 806
2. NFPA 701

B. Treat fabric in accordance with the requirements of the State and other governing authorities (unless fabric is inherently flameproof)

C. Mark each curtain, drape, leg, border, or other fabric item with flameproofing information as required by applicable codes.

D. Provide three copies of certificates of flame resistance treatment to the Architect for distribution to Owner and Fire Department Official.

3.03 FLAMEPROOFING OF FABRICS

A. All fabrics used in the fabrication of the curtains and draperies herein specified, if not inherently flame-resistant by nature and fiber content of their own construction, shall be chemically flameproofed, by immersion process with pressure rolled extraction, in a formula approved by the Bureau of Standards of the United States Department of Commerce, and the finished fabrics, after

treatment shall pass such tests as required by the Fire Marshal of the city of installation. A certificate for each type and color of cloth used in the fabrication of curtains and draperies for this project shall be furnished to the Architect before request for payment for such equipment is made. The certificate shall provide the following information:

1. The name of the Rigging Contractor.
2. The name and color of the fabric covered by the certificate.
3. The name of the firm doing the flameproofing (chemical treatment).
4. The date of the treatment.
5. The date of re-treatment will be required.
6. The name of the chemical formula used.
7. The method of application of the chemical used.
8. The signature of an officer of the company doing the flameproofing.
9. The signature of an officer of the company installing the equipment, herein known as the Rigging Contractor.
10. Both signatures shall be affixed to the certificate. A Notary Public appointed within the State where the flameproofing is done may witness the signature of the officer of the company doing the flameproofing. The signature of the Rigging Contractor may be notarized by a Notary Public appointed in the state of the installation or where the Rigging Contractor's office is located.

3.04 FABRICATION OF CURTAINS

A. All fabrics shall be sewn with box-pleats to specified fullness to jute upholstery webbing. Pleats shall be spaced 12" on center. All thread used in sewing these curtains and draperies shall be cotton mercerized and shall be the color of the fabric on which it is used, both in the needle and bobbin. The needle thread shall not be lighter than #16 in size, and the bobbin thread shall not be lighter than #24 in size. The same size thread shall not be used in both needle and bobbin. Double rows of stitching shall be used to sew the fabrics to the webbing. Bad stitching, missed stitches, puckered seams and hems, etc., will not be acceptable. All seams shall be sewn in straight and even lines.

B. All panels of fabric shall be of a single piece for the entire height of the curtain in which it is used. No splicing of fabric to achieve a desired length of cloth will be acceptable.

C. Linings shall be sewn into the top hem with same fullness as curtain. Vertical hems shall be 1-1/2" and shall fall 6" inside the curtain size. Tack to curtain with 3/4" webbing on 12" center. Bottom hem to be 3" and 6" shorter than curtain. Tack to curtain same as sides. Webbing tacks to allow enough slack to keep from distorting curtains in any way, and to allow for stretching of curtain fabric.

D. Unless otherwise noted, all pile fabrics shall have pile running up.

E. Bottom hems of all curtains shall be 6" and shall be weighed with a #6 galvanized pump chain. This chain shall first be encased within a heavy canvas pocket, with the pocket being sewn inside the top half of the hem, thus keeping the chain from resting on the bottom of the hem.

1. Masking Borders and legs:

a. In addition to the chain pocket, the bottom hem of the curtain shall be lined with heavy canvas and the bottom hem remain open at each end to allow the hem to act as a pipe pocket.

F. Center of all curtains shall be marked clearly on the top webbing. If ties are provided with the curtain, they shall be black in color, except at center, unless otherwise noted.

G. Curtains, which are to be operated on traveler tracks, shall be equipped with black brass grommets set on 12" centers along the top webbing. The curtain or drapery shall be connected to the track carriers by means of a galvanized carrier-to-curtain fastener, as previously specified, at each grommet. Traveler panels shall be sewn with half-width fold-back on both leading and trailing edges.

H. Curtains, or draperies, which are to be 'dead-hung' on battens (legs and borders) shall be un-pleated and shall be equipped with No. 2, or brass grommets and 30" long tie lines made from No. 4 cotton mason's line, the grommets to be set on 6" centers. Vertical hems of all "dead hung" curtains and draperies shall be 6".

I. Fabric cyclorama:

1. The cyclorama curtain shall be one piece, flat with no pleats or seams. Side and top hems shall be the same as a standard curtain. The 6" wide bottom hem shall include a pipe pocket, invisible from the front, with vertical slits 10’-0” on center. Vertical slits shall be reinforced with stitching around the edge. The bottom of the pipe pocket shall sit 2” above the bottom of the bottom hem.

J. After installation in the building in their proper positions and prior to Owner turnover, all curtains shall be thoroughly brushed to remove all loose dust, visible dirt, fabric lint, loose threads, etc. Wrinkles will be permitted to fall out naturally.

K. Curtains shall have a permanent tag (no larger than 4" x 3") affixed to the top, upstage right corner of each finished panel. Each tag shall include the following information:

1. Name of Facility.
2. Name of company installing the equipment specified in this section.
3. Date installed.
4. Finished size (example 24'-0" H x 5'-0" W).
5. Use (see Rigging Schedule).
6. Fabric manufacturer, name, weight, and color.

L. Main curtain and main valance

1. Fabric pile shall run down.
2. Front curtain height shall be determined by field measurement, to ensure that the top of curtain is not visible from any seat in auditorium. Finished height shall be this field measurement or dimension stated in curtain schedule, whichever is greater.

M. Scrim

1. Sharkstooth scrim without interior seams sewn flat with minimum 3 rows of stitching to 3-1/2” jute webbing on top, with No. 2 grommets inserted at 12” spacing. Provide braided cotton tie lines, 30” long, 1 per grommet plus 10% spares. Center to be marked with contrasting colored tie.
2. No interior seams (seamless).
3. Sides edges to have 3” double stitched seams.

    a. Provide grommets at sides at 12” on center.

4. Bottom hem 4” triple hem with a pipe pocket continuously sewn to the backside of the bottom hem. Pipe pocket to be constructed of denim. Pipe pocket to have seamed slot openings every 10’-0” for access to bottom pipe. Pipe pocket to hang 1” above bottom hem. Jute webbing 12” long sewn into ends of bottom hems with two #2 brass grommets 4” apart at corners.
5. Provide bottom pipe for full width of scrim.
6. Color for ties and grommets to be same color as scrim.
7. Color for scrim as indicated in the drawings.
8. Size as indicated in the drawings.

3.05 CLEARANCES

A. Entire rigging system and components shall, when completed, be free running and free from binding, rubbing, bumping, etc., in all respects.

B. Trim all curtains or draperies that are operated on traveler tracks at the drapery trim chain. Curtains shall be trimmed ¼" above the finished floor with a tolerance of +/-1/8".

3.06 INSTRUCTION OF OWNER PERSONNEL

A. A representative of the Contractor, fully knowledgeable and qualified in Rigging Systems operation, shall provide eight (8) hours of instruction to the Owner designated personnel on the use and operation of this System. Designated instruction times shall be arranged through the Owner and will occur over up to two sessions.

B. Instruction shall be scheduled in conformance with test and instruction schedules, and availability of Owner, staff, Architect, Architect’s Consultant, and their representatives. While it may be possible to schedule the instruction session(s) to coincide with the final observation or acoustic commissioning, such coincidence shall not be assumed.

3.07 CLEANING OF THE SITE

A. Remove from the site all rubbish, trash, discarded packing materials, cartons, and other debris caused by daily operations. Upon completion of work, the entire area of work shall be left in broom and mop clean condition.

END OF SECTION 11 61 33

SECTION 11 61 53
STAGE LIGHTING FIXTURES AND PORTABLE EQUIPMENT

PART 1 - GENERAL REQUIREMENTS

1.1 GENERAL

A. General provisions of the Contract apply to work of this section.

B. All lighting fixtures specified herein shall be furnished to the jobsite new and in unopened factory shipping containers. Lamps and accessories shall be packed separate from fixtures.

1.2 GUARANTEE

A. All fixtures shall be guaranteed against defects in materials and workmanship for a period of one (1) year from the date of acceptance by the Owner and/or Architect's Consultant. Fixtures deemed defective within this period shall be replaced by the Supplier at no additional cost to the owner.

B. Quartz lamps shall be guaranteed against defects in materials and workmanship for a period of no less than 90 days from date of acceptance. Arc lamps shall have a full warranty for one-half of rated life and a prorated warranty thereafter to end of rated life. Lamps failing in this period shall be replaced with new lamps at no additional charge.

1.3 SHOP DRAWINGS

A. Shop drawings and equipment data sheets shall be submitted to the Architect's Consultant in accordance with the requirements of the Contract.

B. Acceptance of submitted equipment shall be obtained prior to equipment purchase or fabrication. If shop drawings are rejected, correct and resubmit in the manner as specified. All shop drawing information shall be submitted at the same time; no partial submittals will be accepted.

C. Submit catalog data sheets (8-1/2" x 11"), neatly bound in sets with title page, space for submittal stamps, and tabbed dividers between sections Additional copies of this set of data sheets will be required with record drawings. Catalogs shall contain data sheets, in proper order, on all equipment proposed with part or model number clearly indicated. Provide a complete list of proposed equipment with reference to its corresponding specification section/paragraph number or equipment title. Denote all deviations from specified equipment on the list.

D. Shop drawings shall indicate complete data on fixtures and accessories including but not limited to:

1. Specifications and all photometrics (based on specified lamp) of fixtures
2. Lamp manufacturer(s), types, and quantities
3. Plug and receptacle type and manufacturer
4. Details of C-clamps, safety cable, and gel frames
5. Details of all custom equipment and accessories

1.4 SUBSTITUTIONS

A. Other manufacturers may bid selected equipment. In order to be considered, manufacturers or suppliers other than those specified must submit to the Architect's Consultant a letter expressing their desire to bid. This letter shall be received by the Architect's Consultant not later than ten (10) days prior to date of bid opening, and shall include full details of equipment being offered. These details shall include performance data, weights, and specifications in sufficient detail to fully describe offered equipment. A statement shall accompany the substitute bid. This statement shall be by an officer of the manufacturing firm submitting the proposed substitute that the items on the bill of material are equal to those specified in quality of construction, finish, forms, function, and performance in, of, and by each item. Statements by representatives and sales agents will not be acceptable. The decision of the Architect's Consultant as to the acceptability of the proposed alternate equipment, based on the submitted data, shall be final.

B. Product Substitutions for procedures and requirements. All materials and equipment specified herein have been determined to provide an overall physical appearance and background of proven operation desired by the Owner, and therefore, are specified to establish a standard of quality required for this project. If equipment or material other than that specified is proposed to be furnished, this Supplier shall be required to furnish the Architect's Consultant with such samples as he requires, the same to be submitted by the Architect's Consultant to an independent testing laboratory selected by the Owner for tests to determine the actual equality of the proposed substitute items. All costs and charges incurred by these tests shall be borne by this Supplier. Should such tests prove the substitute materials and equipment equal and acceptable, the Supplier shall be so advised. The Architect's Consultant reserves the right to examine, and where necessary, to have additional tests made by the same independent testing laboratory of the actual equipment delivered to the jobsite to insure that the delivered equipment is equal in fact to that specified. Should such secondary tests prove the equipment is satisfactory, the Owner will pay the cost for such tests. Otherwise, this Supplier shall pay for the tests and shall proceed to remove unacceptable equipment from the jobsite and to provide that specified. The Architect's Consultant's decision, based on this test, shall be final.

C. The specifications are based on specific equipment, accessories, processes and arrangements as indicated therein. Acceptance of the shop drawings and/or submittals indicates only the acceptance of the manufacturer and quality, and assumes that the specific requirements and arrangements are in compliance with the intent of the plans and specifications. This Supplier shall, at no additional cost to the Owner, furnish all accessories, layouts, equipment, etc., and shall perform all work necessary for proper functioning and to fit his substitute items to the intent and arrangement indicated on the plans and in the specification.

1.5 RECORDS FOR OWNER

A. Submit four (4) sets of the following data, prepared in neat brochures or packet folders, to the Architect's Consultant.

1. All warranties and guarantees, and manufacturer's directions on all equipment and material covered by the contract.
2. Equipment brochures (cut sheets).
3. Accepted shop drawings.
4. Any and all other data and/or drawings required during construction.
5. Repair parts list of all major items and equipment.
6. Lamp types used in each fixture type.
7. A list of all accessories with part numbers and data sheets.
8. Owner shall be provided with three (3) complete sets of approved brochures.

1.6 APPROVED MANUFACTURERS

A. For purposes of establishing the quality and performance desired, products of the following companies are approved as manufacturers of the herein specified equipment:

1. Portable lighting fixtures and accessories:
   a. Altman Stage Lighting
   b. Chauvet Professional
   c. Chroma-Q
   d. Robe
   e. City Theatrical
   f. Elation Professional
   g. Electronic Theatre Controls, Inc.
   h. Leviton Manufacturing Company
2. Quartz lamps:
   a. GE Lighting
   b. Osram Sylvania, Inc.
   c. Philips Lighting Co.
3. Arc lamps:
   a. Osram Sylvania, Inc.
   b. Philips Lighting Co.
   c. Ushio America, Inc.
4. Plugs and connectors:
   a. Bates
   b. Hubbell
   c. Leviton
   d. Lex Products
   e. Rosco Labortories, Inc.
   f. Union Connector Co., Inc.
5. Cable assemblies:
   a. act Lighting, “Data”, Tour, and “Power” series.
   b. LEX Products, “PowerFlex” and “Data” series.
   c. TMB Associates “Pro” and “Data” series.
   d. Approved substitution.
   e. Approval indicates approval of the manufacturer only and not approval of specific products. The Contractor shall provide equipment, which meets or exceeds these specifications.

PART 2 - MATERIALS

2.1 GENERAL

A. Provide the herein specified lighting fixtures complete with plugs, accessories, and lamps listed.

B. Provide lamps in quantities shown in the schedule. Provide appropriate lamp type, which will cause fixture to meet or exceed specified performance.

C. Plugs and Connectors

1. Stage pin plugs and connectors where indicated shall be equal to Union 20-2P&GMP series with lugs and **clear** cover unless otherwise noted.
2. Parallel blade Edison plugs shall be NEMA 520P, equal to Hubbell HBL5266EBK unless otherwise noted.
3. Locking 20-amp connectors for fixture power input shall be equal to Neutrik powerCON or powerCON TRUE1 TOP, as required for the specified lighting fixture.

D. Control signal protocols and connectors

1. All control signal protocol and connector types shall comply with the following Standards:
   a. ANSI E1.11 – 2008 (R2018) / Entertainment Technology USITT DMX512 Asynchronous Serial Digital Data Transmission Standard for Controlling Lighting Equipment and Accessories.
   b. ANSI E1.17 – 2015 (R2020) Entertainment Technology Architecture for Control Networks.
   c. ANSI E1.20 –2010 Entertainment Technology –RDM Remote Device Management over DMX512 Networks.
   d. ANSI E1.31 –2018, Entertainment Technology –Lightweight streaming protocol for transport of DMX512 using ACN.
   e. ANSI E1.30 Series of Documents regarding equipment interoperability for control of commonly encountered entertainment technology devices using E1.17.
2. All components shall be compatible within the Stage Lighting Manufacturer's network data system.
3. All control, signal, and video connectors shall be of substantial construction and shall be of the locking or latching type. All plate-mounted connectors shall be bolted to faceplates – rivets shall not be acceptable.

E. All fixtures and accessories shall be labeled with owner-designated initials and/or words in permanent, heat resistant paint in 1/8" block letters. Label all portable cables and jumpers similarly with printed heat-shrinkable tags located at both ends. Include lengths on portable cable labels. Verify label location and lettering on shop drawings prior to engraving or printing.

F. All lighting fixtures shall meet or exceed manufacturer's published electrical, mechanical, environmental, and operational data for listed approved fixtures specified herein.

G. All lighting fixtures shall conform to the following:

1. All fixtures will be 3-wire grounded type. The ground conductor shall be carried to the ground pin of plug. Leads shall be 36" unless otherwise noted and covered by a black heat resistant sleeve.
2. Each fixture, electrical device, and connector shall be approved by a Nationally Recognized Testing Laboratory (NRTL) for stage and studio use; and shall, when furnished and installed, bear a factory affixed NRTL label.
3. Fixture performance information shall be furnished on request without cost and shall be in the form and by methods approved by I.E.S./S.M.P.T.E. for such reports.
4. Fixtures shall have a matte black high-heat resistant finish.

H. LED emitters shall be rated for a minimum nominal 50,000-hour LED life to 70% intensity unless otherwise specified.

I. Unless otherwise noted, each fixture shall include the following accessories:

1. Heavy-duty yoke. Yoke shall be equipped with positive hand locks not requiring tools for fixture focus adjustment.
2. Two color frames.
3. 30" long safety cable, constructed of 1/8" utility cable with 5/16" grommeted snap hook, with black powder coat.
4. Heavy duty C-clamp.
   a. C-clamp shall fit up to 2" (O.D.) pipe with separate adjustments for pipe size, pan, and tilt, providing 360-degree rotation on the horizontal axis.
   b. C-clamp shall be equipped with positive hand locks not requiring tools for fixture pan adjustment. C-clamp shall be equal to the ETC 400CC retrofitted with tee handle for pan adjustment.

J. Refer to Schedule for quantities.

2.2 PORTABLE LIGHTING FIXTURES

A. Profile Fixture – Type P5 – LED - Static, Fixed Beam Angle

1. General
   a. Fixture shall be a high-output color-changing LED profile fixture with precise beam control and pattern projection.

2. Physical
   a. Fixture shall have a die-cast all metal housing.
   b. Power supply, cooling, and electronics shall be integral to each unit.
   c. Fixture control shall be DMX/RDM via 5-pin XLR connectors in and through.
   d. Minimum of +/- 27-degree barrel rotation
   e. Four blade shutter system utilizing at least 3 planes and 20-gauge stainless steel shutters.
   f. Shutter assembly shall offer a minimum of +/-25° rotation.
   g. Accessory slot for gobo, iris, and similar theatrical accessories

3. Optical:
   a. A minimum of RGBxL (red, green, blue, other, lime) color output shall be fully homogenized with no multiple color shadows.
   b. Dimming shall be digitally driven using high-speed pulse width modulation.
   c. Control of LED levels shall be imperceptible to video cameras and shall be capable of being set via RDM to 5,000 Hz or 25,000 Hz.
   d. Interchangeable lens tubes shall be available create different beam angles, including adjustable zoom lenses. Lens tubes should be manufacturer's most appropriate to LED fixtures.

4. LED Emitters
   a. LED module shall have a minimum of 50,000-hour L70 rating.
   b. Fixture shall provide a minimum of 9,400 lumens at maximum output.

5. Thermal
   a. Fixture shall be fan cooled with fan speed control via DMX channel and fan speed software to permit fixture to override DMX fan speed setting to prevent heat damage to the fixture Flicker-free operation.

6. Approved fixtures:
   a. ETC ColorSource V
   b. Approved Substitution

7. Quantities: Refer to schedule.
8. Accessories:
   a. Provide one 5' power adapter with powerCon matched to the fixture, to 20A male Edison for every two fixtures.
   b. In addition to those required in paragraph 2.1, provide the following accessories with each fixture Accessories:
      i. Soft Focus filter
      ii. Smooth wash diffuser
      iii. A-size pattern holder, Quantity per schedule

B. Wash Fresnel Fixture Type WF1 – LED Fresnel

1. General
   a. Fixture shall be a color-mixing, high-intensity LED illuminator with DMX control of intensity and color.

2. Physical:

a. The unit shall be constructed of rugged, die cast and extruded aluminum, free of burrs and pits, finished in black.
b. Unit shall be DMX-controlled and include control pass-through. Unit shall be RDM compatible.
c. Unit shall have a pass-through for power to allow daisy-chaining multiple fixtures on one circuit. Power input shall be Neutrik PowerCon True1.
d. The unit shall be equipped with lens frame holders with a spring-hinged retaining clip on top.
e. Average audible noise from fixture shall not exceed 23dbA.

3. Optical
   a. Fixture shall provide homogenized, flicker-free optics for a consistent, smooth beam.
   b. Fixture shall utilize a RGBIL color system to achieve a wide range of mixed colors.
   c. White light shall be variable 3200-5000K.
   d. Lumen output shall be 5,300.
   e. Fixture shall have a motorized beam angle range of at least 13° to 44°.
4. Electrical
   a. Fixture shall have a self-adjusting power supply capable of operating on 100V to 240VAC, 50/60Hz.
   b. Fixture shall have smooth theatrical-grade dimming to 0% with no “stepping”.
5. Thermal:
   a. Fixture shall be convection cooled or equipped with a controllable cooling fan.
   b. Active cooling, if any, shall provide on-demand cooling, with an option for temporary override.
   c. The fixture shall utilize advanced thermal management systems to maintain LED life to an average of 70% intensity after 20,000 hours of use.
      i. Thermal management shall include multiple temperature sensors within the housing to include:
         a) LED array temperatures
         b) Control Board temperatures
6. Approved Unit:
   a. Electronic Theatre Controls ColorSource V Fresnel
   b. Approved Equal
7. Quantities: Refer to Schedule
8. Accessories:
   a. Provide one 5’-0” power cable with each fixture. Edison to Neutrik powerCon True1.

C. Cyclorama Light Fixtures – Type C1 – LED

1. General
   a. The cyclorama fixture shall be a linear LED wash fixture compatible with ANSI DMX E1.11 standard.
   b. Fixture shall carry an NRTL listing and be labeled upon arrival at the project site.
2. Physical
   a. Fixture shall be housed in a rugged black anodized aluminum extrusion. Housing shall be approximately 69” in length.
   b. Fixture weight shall not exceed 55 pounds and shall be able to mount on battens, truss, or set upright on a flat, stable surface.
   c. Fixture shall be equipped with a cooling fan. Fan speed shall be capable of automatically adjusting based on thermal management needs. Three fan speeds are selectable via DMX and RDM.
   d. Fixture shall operate properly in ambient temperature range of 32°F to 104°F.
   e. Fixture shall be equipped with a user interface consisting of a multi-line
   f. OLED touch-screen display for status and configuration changes

3. Electrical and Optical
   a. Input power ratting shall be 100-240VAC, 50/60Hz, with a power factor of 0.96 at 120VAC.
   b. Fixture shall be equipped with input and thru power via Neutrik powerCON TRUE1 connectors.
   c. Fixture shall be equipped with data in and thru connectors via Neutrik XLR 5-pin connectors.
   d. Fixture shall have a theatrical dimming curve with variable strobe capability.
   e. LED life shall be a minimum of 50,000 hours L70.
   f. LED emitters shall have a minimum resolution of no greater than 3 inches.
   g. Fixtures shall be factory calibrated to ensure color match from fixture to fixture.
   h. Fixture shall have a native beam diameter of approximately 22° and field diameter of approximately 44°, with fully homogenized lenses eliminating multiple color shadows (skittles).
   i. A cyclorama lens shall be available to alter the beam and field angles to approximately 43° and 108°.
   j. Color temperature shall be adjustable from 1,000° -10,000° Kelvin.
4. Approved Cyclorama Unit:
   a. Chroma-Q Color Force II 72 w/ cyc optic
   b. Approved Equal
5. Quantities: Refer to schedule
6. Accessories:
   a. Provide one (1) 5’ power input cable with powerCon TRUE1 TOPS to male NEMA L5-20 for every two fixtures.
   b. Provide the following accessories with each fixture in addition to those indicated in paragraph 2.1:
      i. Cyc Lens
      ii. Floor Trunions
      iii. Pipe Clamps as necessary for batten mounting

D. Automated Spot Fixture, Type A1 – LED (Robe Forte FS)

1. Fixture shall be a robotic yoke LED spotlight fixture with DMX512A control of intensity, color, pan, tilt, and pattern projection. Fixture shall be compatible with ANSI RDM E1.20 standard.
2. Fixture shall carry an NRTL listing and shall be UL1573 listed for stage and studio use.
3. Physical
   a. Fixture shall be of rugged aluminum construction free of burrs and pits, and finished in a black, non-reflective coating.
   b. Covers of head and yoke shall be black ABS textured plastic and shall fasten to the head frame with captive fasteners.
   c. Fixture weight shall not exceed 80 pounds and shall be able to mount on battens, truss, or set upright on a flat, stable surface.
   d. Pan and tilt: 540°/270°, controlled via 16-bit control and absolute position encoder sensors for correct step positioning.
      i. Pan speed: < 5.0s for 540° of movement.
      ii. Tilt speed: < 3.0s for 265° of movement.
   e. Control user interface module shall be provided with the option for battery power to allow fixture settings to be adjusted while the fixture is unplugged.
   f. Fixture shall be convection cooled for silent operation. Controllable fan is not acceptable.
   g. Fixture shall operate properly in ambient temperature range of 32°F to 95°F.
   h. Fixture shall be equipped with a user interface consisting of 6-button input panel and multi-line color LCD display for status and configuration changes.

4. Electrical and Optical
   a. Fixture shall high incorporate at least 88 brightness LED emitters with a measured 23,000 lumens at 6,800°K. Emitters shall have a nominal rated life of 50,000-hour, L70 rating, and shall undergo a 12-hour factory burn-in test. Manufacturer of LED emitters shall utilize an advanced production LED binning process to maintain color consistency.
   b. The LED system shall use 16-bit DMX control techniques for high-resolution dimming. The fixture shall utilize an incandescent dimming curve. Dimming curve shall be optimized for smooth dimming over longer timed fades.
   c. Power supply, cooling, and driver electronics shall be integral to the fixture.
   d. Fixture shall have power factor correction greater than0.92 from 90VAC to 265VAC.
   e. Fixture shall use a minimum of 4-pairs of dichroic color flags for subtractive color mixing. Color of flags shall be:
      i. Cyan
      ii. Magenta
      iii. Yellow
      iv. CTO
   f. Fixture shall incorporate an inter-changeable color wheel with the following colors plus open:
      i. Red
      ii. Blue
      iii. Green
      iv. Yellow
      v. Orange
      vi. Purple
      vii. Dark Blue
   g. Fixture shall have seven interchangeable rotating, gobos, indexable for 360°, and eight interchangeable non-rotating gobos with a 30mm diameter and 25mm image area. Gobos shall be interchangeable with glass or metal without modification to the wheels or cartridges.
   h. Fixture shall be equipped with a four-blade framing shutter system capable of + or -60° rotation.
   i. Rotating fixed pattern wheel shall allow for animation in two directions and shall contain an effect pattern made up of at least six (6) unique and continuous breakup patterns.
   j. Fixtures shall have motorized zoom of 5°-55° field angles, and a frost system which softens the edges of the projection on a surface that applies evenly across the beam and allows for variation in insertion time without reflections or uneven distribution of diffusion.
   k. A sixteen-leaf iris which reduces the projection area by 83% minimum.
   l. Minimum optical properties shall be as follows:
      i. Color temperature 6,000°K – 7,000°K.
      ii. Output field lumens: 23,000
      iii. PWM frequency: 1,200Hz to 16,000Hz
   m. 100-240 VAC 50/60Hz, auto-ranging
   n. Fixture shall be equipped with True One powerCON IN and THRU connectors.
   o. Data connector shall be DMX-512, 5-pin XLR, with in and thru connectors.
   p. Fixture shall reach a minimum CRI rating of 85.
   q. Approved Fixture:
      i. Chauvet Professional: Maverick Silens 2 Profile
      ii. Approved substitution
   r. Accessories –
      i. Provide 5’ True One powerCON power input connector with NEMA L6-20 plug for 50% of fixtures plus one.

ii. In addition to those required in paragraph 2.1, provide the following accessories with each fixture:
iii. Omega brackets with mounting hardware for truss mounting.

2.3 PORTABLE LIGHTING FIXTURES AND ACCESSORIES SCHEDULE

A. Fixtures Schedule:

FIXTURE QUANTITY

	SPACE A
PROFILE – TYPE P5: Static, fixed beam angle, LED	
LED Light Engine and fixture housing	85
10-Degree EDLT Lens Tube	16
14-Degree EDLT Lens Tube	19
26-Degree EDLT Lens Tube	38
36-Degree EDLT Lens Tube	12
WASH FRESNEL – TYPE WF1: Static, LED	32
CYCLORAMA FIXTURE – TYPE C1:	9
AUTOMATED FIXTURE – TYPE A1:	2

B. Accessories:

1. Spare Lamps: Provide spare lamps in the quantity indicated for each lamp type. Minimum spare quantity of any lamp type shall be one.
2. DMX terminator shall be a a 5-pin male XLR connector. Contacts shall be gold plated. Termination resistance shall be 120 ohms ±10%, between pins 2 and 3. Termination power capacity shall be 2 watts and absorbing capacity shall be 500W. Transient clamp time shall be less than 5nS with transient clamp voltage of ±7 volts. Terminator shall be equal to Doug Fleenor Design, TERM, T2.
3. Pattern Holder – Provide type A pattern holders for steel patterns. Holders shall fit the specified profile units.
4. Iris assembly kit. Units shall fit specified profile units and provide smooth control of beam size. Leaves shall be tempered and heat resistant up to 1,000°F. Equal to City Theatrical Drop-In Iris.
5. Top hats shall be properly sized for specified profile fixtures. Top hat shall be made of lightweight materials capable of withstanding the heat from the fixture without compromising performance. The unit shall be matt black with the inside of the unit flocked to maximize glare reduction. Unit shall be available in full size and half size, with an overall length of 5-inches. Shall be equal to City Theatrical Standard Top Hat.
6. 4-Way barndoor for wash fixtures shall be sized for the specified fixture. Four aluminum leaves shall be attached to the housing with nylock nuts to allow for tension adjustment. Housing shall be round to allow for rotation in fixture accessory clips. Finish shall be matt black.
7. Lighting Booms:
   a. Boom pipe shall be 1.5” schedule 40 pipe, 16’ tall, threaded on both ends. Clean and degrease pipe then paint black.
   b. Base Plate: Steel base plate for boom pipe. Plate shall be 20” square and have two threaded holes for 1.5” pipe. One shall be centered on the plate, the second centered along one edge. Plate shall have slots to accept attachment of square or triangular truss from 12” to 20.5” in size. Each rounded corner of the plate shall accept 5/8”x11 threaded fasteners for bolting down plate, leveling feet, or casters. Plate shall be black. Equal to Entertainment Fabrication Ultimate Theatre Base Plate 20”.

c. 50lbs Cast iron boom bases w/flange threaded to receive 1-1/2" Sch. 40 pipe. Equal to Altman B-50.
d. 60lbs Steel base, 20"x20"x1", with threaded center and edge holes to receive 1-1/2" Sch. 40 pipe. Equal to Entertainment Fabrication EF-1049.
e. Tie-off ring for 1.5" boom pipe. Tie-off ring shall be equal to Altman 530.
f. Side Arm, 18" with single Tee. Equal to Altman Model No. 509-18-1.
g. Side arm, 24" with two sliding Tees. Equal to Altman Model No. 509-24-1.

8. Stage ghost light shall carry a NRTL listing as a portable luminaire. The luminaire shall be rated for up to 100W A type lamp. The luminaire shall be 72" tall and ride on a three-legged castered base. The fixture shall be finished in black enamel Panton color 7408-U Provide with a 100W equivalent LED lamp. Equal to Altman GHOSTLIGHT. GL-Schuler.

C. Accessories Schedule:

ITEM	QUANTITY
DMX terminators	(1) For each (6) DMX controlled fixtures
Pattern Holders, A-size	20% of Fixture type P1 & P2
Iris assembly kit	10% of Fixture type P1 & P2
Top hat: Full	15% of Fixture type P1 & P2
Top hat: Half	15% of Fixture type P1 & P2
Barn Doors	One for every two WF1 Fixture
Lighting Booms:	
Boom Pipe	8
Base plate	8
Tie-off ring	8
Side arm - 18" with 1 tee	24
Side arm - 24" with 2 tees	16
Stage ghost light: Altman GHOSTLIGHT or equal, with 100W LED equivalent	1

2.4 LIGHTING SUPPORT EQUIPMENT

A. Portable Cables

1. Lighting Network Cables.
   a. RJ-45 connector to Category 5 cable equal to Belden 1872A to RJ-45 connector. Each cable to be Category 5 Certified.
   b. Provide lengths and quantities as listed in Lighting Support Equipment Schedule.
2. DMX Control Cables.
   a. Neutrik XLR 5-pin male to DMX cable equal to Belden 1583A, to Neutrik XLR 5-pin female.
   b. Provide lengths and quantities as listed in Lighting Support Equipment Schedule.
3. Single Circuit Cables – Edison
   a. Jumper Cable – NEMA 5-20M to Type SO 12/3 cable to NEMA 5-20F
   b. Provide lengths and quantities as listed in Lighting Support Equipment Schedule.
4. Single circuit cables – powerCON
   a. Jumper Cable – Neutrik powerCON 20A female to Type SJO 14/3 to Neutrik powerCON 20A male.
   b. Provide lengths and quantities as listed in Lighting Support Equipment Schedule.
5. Single circuit cables – powerCON TRUE1 TOP

a. Jumper Cable – Neutrik powerCON TRUE1 20A female cable connector to Type SJO 12/3 to Neutrik powerCON TRUE1 20A male cable connector.
b. Provide lengths and quantities as listed in Lighting Support Equipment Schedule.

B. Cable Bundle Wraps

1. Provide 3/4" wide hook and loop tie-wraps for bundling of portable cables. Tie-wraps shall be imprinted with owner designated initials and/or words. Provide one tie-wrap of suitable length to properly bundle each high and low voltage cable listed in Lighting Support Devices Schedule.

C. Devices:

LIGHTING SUPPORT DEVICES	QUANTITY
PORTABLE POWER AND DATA RELAYS – WIRELESS DMX	
Transmitter	1
Receiver	1
PORTABLE CABLE TYPE	
NETWORK CABLE	
6-foot	10
10-foot	10
25-foot	10
DMX CABLE	
6-foot	75
10-foot	75
25-foot	40
50-foot	10
100-foot	2
SINGLE CIRCUIT CABLE - JUMPERS	
EDISON	
6-foot jumpers	5
10-foot jumpers	20
25-foot jumpers	10
50-foot jumpers	4
100-foot jumpers	2
36” Two-fer	16
powerCON TRUE1 TOP	
6-foot jumpers	75
10-foot jumpers	75
25-foot jumpers	40
50-foot jumpers	10

2.5 PERSONNEL LIFTS AND LADDERS

A. PERSONNEL LIFT

1. Single-person standard aerial work platform with sliding mid-rail (vertical mast)
2. Outrigger storage when not in use
3. Controls:
   a. Up/down switch
   b. Outrigger set-up confirmation lights
   c. Lock-out key switch
   d. Auxiliary lowering in event of power failure
   e. Low battery indicator
4. Fit through standard doorways
5. Operate on 120VAC
6. Working Height: 35’-6”
7. Capacity: 350#
8. Approved Manufacturers:
   a. Genie AWP-30S
   b. JLG 30 AM
9. Quantity: One (1)

B. LADDERS

1. Meet or exceed applicable ANSI and OSHA standards
2. Fiberglass frame
3. Stepladder style 12’ and under
   a. Slip-resistant steps
   b. Heavy-duty spreaders
   c. Full set of rear horizontals
   d. Slip-resistant rubber feet
4. Extension ladder style over 12’
   a. Enclosed rope pulley
   b. Engage full fly rail
   c. Slip-resistant D-rungs
   d. Slip-resistant rubber feet
5. Capacity: 300#
6. Approved Manufacturers:
   a. Werner
   b. Louisville
7. Quantity
   a. One (1) at 8’
   b. One (1) at 12’

PART 3 - EXECUTION

3.1 INSTALLATION

A. Unpack fixtures, install lamps, plugs, C-clamps, and adjust all lighting fixtures to manufacturer’s specified performance in presence of Owner’s personnel.

B. Unpack and install lamp, yoke, stands, ballasts, plugs, and accessories for follow spotlights in the follow spot room.

C. Place all other equipment at Owner designated storage location. Supplier will not be expected to hang and/or focus equipment.

D. Remove from the site all rubbish, trash, discarded packing materials, cartons, and other debris caused by this Supplier. Upon completion of work, the entire area of work by this Supplier shall be left in broom clean condition.

3.2 STAFF INSTRUCTION

A. The Manufacturer's supervisor shall instruct designated representatives of the Using Agency in the safe operation, servicing, care, and maintenance of all items, including storage. Minimum one 6-hour session for designated representatives.

B. The Architect/Engineer and other representatives may be present or represented.

C. Instruction shall be scheduled in conformance with test and instruction schedules, and availability of Owner. staff, Architect, Architect's Consultant, and their representatives. While it may be possible to schedule this instruction session to coincide with the final observation, such coincidence shall not be assumed.

D. Completion of staff instruction shall be verified, in writing, with the signature of an authorized Owner's Representative within 5 business days of completion. Copies will be given to the Owner, the General Contractor, the Architect and the Consultant.

3.3 ACCEPTANCE BY OWNER

A. Acceptance testing will include operation by the Architect's Consultant of each component deemed necessary. Supplier will assist as necessary in this testing and will provide test equipment as required.

B. In the event the need for further adjustment or work becomes evident during observation and/or acceptance testing, the Supplier will continue his work until equipment is deemed acceptable and at no addition to the contract price. If approval is delayed because of defective equipment or failure of equipment or installation to meet the requirements of these specifications, the supplier will pay for any additional time and expenses of the Architect's Consultant.

END OF SECTION 11 61 53

SECTION 11 61 63
STAGE LIGHTING POWER AND CONTROL SYSTEM

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

A. For the sake of brevity these specifications shall omit phrases such as "(Sub)Contractor shall furnish and install", "unless otherwise indicated or specified", etc., but these phrases are nevertheless implied. Mention of materials and operations requires the (Sub) Contractor to furnish and install such materials and perform such operations complete to the satisfaction of the Architect's Consultant. Exceptions are noted herein or shown on the drawings.

B. No representative of the Owner shall have power to waive the obligations of this Contract for the furnishing of good materials or of performing good work, as herein described, in full accordance with the Contract Documents. The failure of any representative of the Owner to condemn any defective work or materials shall not release the obligation to at once tear out, remove, and properly replace the same at any time prior to final acceptance and upon discovery of said defective work or material. However, when requested, the Owner's representative shall observe and accept or reject any material furnished; and in the event the material has been once accepted by the Owner's representative, such acceptance shall be binding on the Owner unless it can be clearly shown that such material does not meet the specifications for this work.

C. All work provided under this section shall be provided by a qualified Theatrical Lighting Contractor. The qualified Theatrical Lighting Contractor shall demonstrate the following at time of bid submission:
   1. No less than five (5) years experience installing theatrical lighting of similar scope and magnitude
   2. No less than ten (10) projects of similar scope and magnitude, which the dealer has installed.
   3. Maintain a showroom open to the public thirty (30) or more hours per week located in a commercially zoned area.
   4. Employ at least one full time retail sales person.
   5. Maintain an inventory, held for resale, of at least $50,000, with the value based on the manufacturer's published net pricing.
   6. Offer for retail sales at least ten (10) lines of product purchased directly from at least ten (10) different recognized entertainment equipment manufacturers on open account.
   7. Hold a valid business license and/or resale tax permit for the location in which the work will occur.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, other General Requirement Sections, apply to work of this section.

B. All work shown on Contract Drawings TL series is provided under this section. Refer to these drawings for plans, graphic representations, schedules, and notations showing Stage Lighting Power and Control Systems work.

C. Also refer to Theatre Rigging, and E Series drawings for related work.

D. Switches, switchboards, contactors, panel boards, transformers, conduit, wire, outlets, connectors and other electrical devices specified herein or on accompanying drawings shall conform to provisions of other sections of Division 26 of the Contract Documents unless otherwise noted.

1.3 SCOPE OF WORK

A. Work under this section shall include the of all labor, materials, tools, transportation services, and supervision necessary to complete the installation of the Stage Lighting Power and Control Systems and other items as herein listed, all as described in these specifications, as illustrated on the drawings, and as directed by the Architect's Consultant. Work is comprised of, but not limited to, the following principal items:
1. House light control system
2. Stage light power, distribution and control system
3. Control console(s) and control devices
4. Control outlets, relays, connections, and wiring.
5. Custom panels and equipment
6. Work light fixtures and control
7. Stage Manager console
8. Theatre stage edge protection lighting
9. DMX-controlled relay panels
10. Theatrical transfer switches
11. Emergency transfer equipment

B. Furnish and install complete Stage Lighting Power and Control Systems with all necessary apparatus and equipment, wiring, etc., required to insure complete systems in excellent working order as specified herein and on the attached diagrams.

C. Consistent with the detailed information contained in this specification, it is the responsibility of the Contractor to supply complete and functional overall systems. Verify complete parts lists, the accuracy of the type numbers and the overall suitability of the equipment to provide functional systems coordinated and interfaced with related work. Provide repeaters, additional switches, and similar equipment as needed for cable length limitations.

D. Minor items of equipment needed in order to meet the requirements stated above, even if not specifically mentioned herein or on the drawings, shall be provided in quality equivalent to other conditions on the project with no claim for additional payment.

1.4 JOB CONDITIONS

A. Verify all conditions on jobsite applicable to this work. Coordinate with scheduled work of other trades. Notify Architect's Consultant in writing of discrepancies, conflicts, or omissions prior to commencement of work or correct same at Contractor's expense.

B. The drawings show diagrammatically the cables, conduit, wiring, and so far as possible, the arrangement of equipment, which fit into the spaces available without interference. If conditions exist at the jobsite which make it impossible to install work as shown, prepare and submit drawings to the Architect's Consultant for approval showing how the work may be installed and, on approval, install the work without additional cost to the Owner.

C. Contractor shall take care not to damage any equipment or to disconnect any wiring other than as required to interface new system. Any contractor-damaged equipment shall be repaired or replaced by the Contractor at no cost to the Owner.

D. Approval indicates approval of the manufacturer only and not approval of specific products. The Contractor shall be required to provide equipment that will meet or exceed the intent of these specifications.

1.5 SUBSTITUTIONS

A. Notwithstanding any reference in the specifications to any article, device, product, materials, fixtures, form, or type of construction by name, make, or catalog number, such reference shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition; and the Contractor in such cases, may at his option use any article, device, product, material, fixture, form or type of construction which in the judgment of the Architect's Consultant, expressed in writing, is equivalent to that specified.

B. All materials and equipment specified herein have been determined to provide an overall physical appearance and background of proven operation desired by the Owner, and therefore, to establish a standard of quality required for this project. If equipment or material other than that specified is proposed to be furnished, this Contractor shall be required to furnish the Architect's Consultant with such samples as he requires, the same to be submitted by the Architect's Consultant to an independent testing laboratory selected by the Owner for tests to determine the actual equality of the proposed substitute items. All costs and charges incurred by these tests shall be borne by the Contractor. Should such tests prove the substitute materials and equipment equal and acceptable, the Contractor shall be so advised. However, the Owner reserves the right to examine, and where necessary, to have additional tests made by the same independent testing laboratory of the actual equipment delivered to the jobsite to insure that the delivered equipment is equal in fact to that specified. Should such secondary test prove the equipment is satisfactory, the Owner will pay the cost for such test. Otherwise, the Contractor shall pay for the test and shall proceed to remove unacceptable equipment from the jobsite and to provide that specified. The Architect's Consultant's decision, based on this test, will be final.

C. The plans and specifications are based on specific equipment, accessories, processes and arrangements as indicated herein. Acceptance of the shop drawing submittal indicates only the acceptance of the manufacturer and quality and assumes that the specific requirements and arrangements are in compliance with the intent of the plans and specifications. The Contractor shall at no additional cost to the Owner, furnish all accessories, layouts, equipment, etc., and shall perform all work necessary for proper functioning and to fit his substitute items to the intent and arrangement indicated in the specifications.

D. If a substitute system is selected, any changes in architectural, electrical, or structural systems required as a result of the alternate system shall be provided by this Contractor at no additional cost to the Owner. The decision of the Architect's Consultant as to the compliance of the proposed system based on the submitted data and demonstrated system shall be final.

1.6 SHOP DRAWINGS

A. Shop drawings and equipment data sheets shall be submitted to the Architect's Consultant in accordance with the requirements of these specifications. Contractor assumes the responsibility for the accuracy of all dimensions and quantities.

B. Acceptance of submitted equipment shall be obtained prior to equipment purchase or fabrication. If shop drawings are rejected, correct and resubmit in the manner as specified. All shop drawing information regarding this Section shall be submitted at the same time; no partial submittals will be accepted.

C. Shop drawings shall be performed at a scale of not less than 1/8" = 1'-0" for plans and 1/4" = 1" for details. Drawings and catalogs shall be marked to show the name of project, date, Architect's Consultant, Contractor and/or Manufacturer and Supplier.

D. Drawings: Submit a complete set of shop drawings in electronic Portable Document Format (PDF) for review prior to fabrication. PDF shall include a Table of contents and bill of materials. Document shall also contain PDF bookmarks to plans, sections and major system details. Drawings shall indicate complete details and dimensions of all work to be performed, including all equipment types and locations, contractor-fabricated equipment and all other details required to describe work to be performed. Shop drawings shall contain at least the following details:
   1. Control consoles, panels, and device layouts and schematic diagrams
   2. Dimmer bank and power panel layouts and schematic diagrams
   3. Fabrication details of custom consoles, panels, devices and enclosures
   4. Wiring diagrams of all specified systems and connections between systems
   5. Riser diagrams showing conduit and wiring requirements (indicating number of conductors, type of wire, and wire installation numbers to be used in each conduit)
   6. Fully dimensioned custom panel and plate details indicating complete manufacturer part numbers for all switches, knobs, meters, connectors, engraving, etc.
   7. Plugging device layouts, numbering and circuiting. Submittals with plug strip layouts not showing circuit numbers will be returned rejected.
   8. Detail of small scale circuit plot.
   9. Details of Work Light Fixture Assembly

E. Catalog Sheets: Submit a complete set of product data sheets (8-1/2" x 11"), neatly organized with title page, space for submittal stamps, and tabbed dividers between sections. Additional copies of this set of data sheets will be required with record drawings. Submittal shall contain data sheets, in proper order, on all equipment proposed with part or model number clearly indicated. Fixture data sheets shall include photometrics. Provide a complete list of proposed equipment with reference to its corresponding specification section/paragraph number or equipment title. Denote all deviations from specified equipment on the list.

F. The plans and specifications are based on specific equipment, accessories, processes, and arrangements as indicated herein. Acceptance of the shop drawing submittal indicates only the acceptance of the manufacturer and quality and assumes that the specific requirements and arrangements are in compliance with the intent of the plans and specifications. The Contractor shall at no additional cost to the Owner, furnish all accessories, layouts, equipment, etc., and shall perform all work necessary for proper functioning and to fit his substitute items to the intent and arrangement indicated in the specifications.

1.7 RECORDS FOR OWNER

A. Drawings: Maintain a full record set of drawings on the job to show the actual installation of the work performed.
   1. Submit a complete set of drawings in PDF showing 'as installed' work to the Architect’s Consultant for review. If 'as installed' documents are rejected, correct and resubmit in the manner specified.
   2. Upon acceptance, provide four (4) sets of drawings and four (4) USB data storage devices with electronic copy in PDF showing 'as installed' work. to the Architect’s Consultant for review. PDF files shall include cover page, table of contents, and PDF bookmarks to plans, sections, and major details.

B. Manuals: Submit four (4) sets each of the following manuals in hardcopy along with four (4) electronic copies in PDF format to the Architect’s Consultant for review. Manuals (8-1/2" x 11") are to be neatly bound and include title page with the name of the project, date, Owner, Architect’s Consultant, Contractor, Manufacturer and/or Supplier. PDF files shall include cover page, table of contents, and PDF bookmarks to plans, sections, and major details. The manuals are to be supplied as follows:

1. Operation and Instruction Manual, including:
   a. Table of contents.
   b. Brief description of the operation of each system, (descriptions shall be written such that new personnel may read the manual and be able to set-up and operate the systems.)
   c. Manufacturer's operation instructions for all user-operated equipment.
   d. Small scale, clear laminated plan(s) showing the location and circuit numbers for all dimmed circuit outlets and network devices and taps.
2. Maintenance Data Manual:
   a. Table of contents.
   b. A list of all equipment supplied under this contract with manufacturer's name, model and part number.
   c. A listing of equipment manufacturer's/supplier's addresses for all equipment covered under this contract.
   d. All equipment warranties and guarantees including Contractor's guarantee. Explain the limits of the warranty, and whom to contact for service, including telephone numbers answered 24 hours per day so that the Owner may obtain 24-hour service when required.
   e. Manufacturer's owner and service manuals on all equipment under this contract.
   f. Accepted shop drawing catalog data sheets including fixture brochures and lamp data.
   g. Replacement parts lists of all major items and equipment indicating specific part ordering numbers including lamp type replacements.
   h. All test results required under these specifications.
   i. Any and all other data and/or drawings required during construction.

1.8 TESTS AND OBSERVATIONS

A. The entire job shall be, during and/or after construction, subject to observations by:
   1. Architect’s Consultant: Upon notice, Contractor shall furnish no more than two (2) persons (one to be the job foreman) and tools for a reasonable amount of time to assist with tests and observations as requested by the Architect’s Consultant. A technician familiar with the project and system programming shall be present.
   2. Government or authority having jurisdiction.

B. After completion of installation and preliminary tests by the Contractor, observation of the work shall be performed by the Architect’s Consultant. The cost of periodic trips to the jobsite for final observation by the Architect’s Consultant has been provided for in the Architect’s Consultant's contract. The cost of any additional trips to the jobsite due to delays, omissions, or mistakes by the Contractor shall be borne by the Contractor.
   1. System commissioning shall be overseen by a knowledgeable representative of the Contractor. A technician knowledgeable with the programming of the system must be available on site for a portion of system commissioning to set and adjust presets and entry panels.
   2. In order for the Architect’s Consultant to observe system commissioning, the following elements must be in place:
      a. Stage Lighting Power and Control system must be complete, with all components installed, energized, and initialized. All installed lighting fixtures addressed and operational.
      b. Rigging control system must be operational.
      c. All electrical components must be operating on permanent building power.
      d. Manufacturer system turn-on complete.
      e. Preliminary programming set.

f. Complete access to areas where the stage lighting systems are installed, including the stagehouse, catwalks, audience chamber, control booths~~,~~, electrical rooms, and other system components.

g. Loose equipment available, with initial programming, if applicable.

3. Contractor is to provide any equipment that may be necessary to access system components, including personnel lifts and/or ladders.

1.9 WARRANTY

A. All labor and materials provided under this contract shall be guaranteed for a period of one (1) year following the date of final acceptance by the Owner. All equipment with factory warranties greater than one year shall have their warranties under the Owner's name. All defects occurring in labor or materials within the one-year guarantee period shall be rectified by replacement or repair.

B. Contractor, or entity providing warranty, within this guarantee period shall answer all service calls within a 24-hour period and repair or replace any faulty items(s) within 48-hours after initial service call without charge to the Owner.

C. Incandescent, quartz, and low voltage lamps shall be guaranteed against defects in material and workmanship for a period of ninety (90) days from date of acceptance. Lamps failing in this period shall be replaced with new lamps at no cost to the Owner.

1.10 PERMIT

A. Obtain all permits necessary for the execution of any work pertaining to the installation, and conform in all trades with all applicable codes/regulations. Obtain all permits necessary for operation of any equipment by the Owner.

PART 2 - EQUIPMENT

2.1 GENERAL

A. All components and systems shall be in new condition and of first quality.

B. State-of-the-art assurance: No products shall be accepted if they have been discontinued or superseded at the time of shipment. For such items, the manufacturer shall make products of comparable function to the specification available to the project at no additional cost. Should the manufacturer have developed a later model of specified units, the latest developed unit shall be provided without additional cost to the Owner. Should the manufacturer develop products of comparable function above and beyond the specification of the listed product, the manufacturer may offer the newly developed product for use on the project. The manufacturer shall notify the Architect's Consultant of any developments to the specified products and shall note any change in the requirements of building infrastructure(s) to support the developments. The Architect and Architect's Consultant shall then determine whether upgraded products shall be accepted.

C. Where acceptable, equipment items are specified by catalog number only; device shall meet all published manufacturer's specifications. Where quantities are not given, refer to drawings. Where two or more products are listed, contractor may use either at his option. Equipment shall not be substituted without specific written approval by the Architect’s Consultant, per the substitution paragraphs of these specifications.

D. Reference to equipment by name, make, or catalog number shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition.

E. All multi-conductor connectors shall be wired in accordance with the recommended practice RP-1 as published by the United States Institute for Theatre Technology.

F. Control signal protocols and connectors
   1. All control signal protocol and connector types shall comply with the following Standards:
      a. ANSI E1.11 – 2008 (R2018) / Entertainment Technology USITT DMX-512-A Asynchronous Serial Digital Data Transmission Standard for Controlling Lighting Equipment and Accessories.
      b. ANSI E1.17 – 2015 Entertainment Technology – Architecture for Control Networks.
      c. ANSI E1.20 – 2010 Entertainment Technology – RDM Remote Device Management over DMX512 Networks.
      d. ANSI E1.31 – 2016, Entertainment Technology – Lightweight streaming protocol for transport of DMX512 using ACN.
      e. ANSI E1.30 Series of Documents level equipment interoperability for control of commonly encountered entertainment technology devices using E1.17.
   2. All control, signal, and video connectors shall be of substantial construction and shall be of the locking or latching type.
   3. All plate-mounted connectors shall be bolted to faceplates – rivets shall not be acceptable.

G. All keys for devices in each theatre (i.e. control console, entry panels, dimmer racks, etc.) shall be keyed identically. Provide a total of (2) keys for each keyed device.

2.2 APPROVED MANUFACTURERS

A. For purposes of establishing the quality and performance desired, the following companies are approved as manufacturers:
   1. Power Devices
      a. Electronic Theatre Controls, *https://www.etcconnect.com/*
      b. LynTec, *https://lyntec.com/*
   2. Wiring devices
      a. Electronic Theatre Controls, *https://www.etcconnect.com/*
      b. Leviton, *https://www.leviton.com/en*
      c. LEX Products, *https://www.lexproducts.com/*
      d. SSRC, *http://www.ssrconline.com/index.html*
      e. Vari-Lite , *https://www.vari-lite.com/global*
      f. Union Connector, *https://www.unionconnector.com/*
   3. Control devices
      a. Electronic Theatre Controls, *https://www.etcconnect.com/*
      b. MA Lighting, *https://www.malighting.com/*
      c. Pathway Connectivity, *https://www.pathwayconnect.com/*
      d. Vari-Lite, *https://www.vari-lite.com/global*
      e. TMB, *https://tmb.com/*

2.3 CONTROL AREA WORK LIGHT

A. Littlite model L-18-LED 18" high intensity gooseneck lamp with model WB weighted base. Furnish in addition to those specified for control console(s).

B. Quantities:
   1. Auditorium - Quantity: 2

2.4 HOUSE LIGHT CONTROL SYSTEM

A. House Light Control System shall be configured to provide controlled and dimmable house and preset stage lighting for presentations or rehearsals. System shall be controlled by a microprocessor based, user programmable device. Remote Control Stations located throughout the theater may address the system.

B. The system shall support no less than 32 wall stations or remote devices in any number of rooms. A minimum of 1536 dimmers may be assigned to one of 128 system control zones. A minimum of 250 presets and system events shall be provided. The system shall receive inputs from the following devices:
1. Remote Control Stations
2. Stage Lighting Control Console
3. Stage Lighting System Network
4. Ethernet based control signals
5. PCs
6. Contact closure stations
7. RS232/422/485 Serial communication

C. The system shall process incoming information and distribute it to dimmer bank, building management systems, and other associated devices.

D. The system shall have the ability to connect multiple processing units into one large system via onboard twisted pair and/or fiber optic Ethernet connections.

E. The system shall operate on the Stage Lighting System Network as a native device.

F. A configuration program shall allow the following functions:
1. Patching dimmers to zones with proportional levels and user selectable dimmer output curves
2. Programming presets and system events
3. Naming of presets and channels
4. Setting room and station assignments

G. Electrical
1. The system shall operate from a processor unit which shall be a microprocessor based, solid-state device. Field programmable system configuration and program information shall be stored in Flash Memory, which shall not require battery backup. Systems without a simple method of backup shall not be acceptable.
2. A DMX-512 input shall be provided for snapshot input via the dimmer bank control module. This input shall accept level information from any DMX source. The DMX-512 input shall be opto-isolated from all other electronics with the isolation exceeding 1500 V.
3. A DMX-512 output shall be provided. This output shall transmit level information to the dimmers bank and other DMX operated devices.
4. A control network port shall be provided for communications with control devices. The network shall utilize polarity-independent, low-voltage Class II unshielded twisted pair (UTP) wiring. The network topology may be bus, loop, home run, or any combination of these three.
5. Operating voltage for the processor shall be provided by the dimmer bank control module. In the event of power loss, the processor shall return to its last valid state when power is restored.
6. An Ethernet network port shall be provided for communications and linking via the Stage Lighting System Network.

H. System Functions
1. It shall be possible to record presets, consisting of any number of zones set to any level with an associated fade time. It shall be possible to recall a preset from a pushbutton, remote input, astronomical time clock event (ATC) or macro.
2. A macro language shall allow sequences of presets and system events to be stored and recalled. Conditional arguments may be used within a macro to check

time or input states. Macros may be assigned to pushbuttons, remote inputs, and/or ATC events.

3. An internal ATC shall allow presets and system events to be recalled at a preprogrammed time relative to sunrise or sunset or at a specific time of day. Systems not providing an internal ATC shall not be acceptable.
4. Each system shall be able to lock out Remote Control Stations. The system shall be unlockable at any "Master Station" using a 4-digit code.
5. Stations shall be configurable in mirrored condition so that a change in one station will effect the same change in the mirrored station.
6. System and Stage Lighting Control Console control signals shall have the capability of operating dimmers simultaneously in pile-on mode.
7. System shall be controllable from other such systems as a single entity across the Stage Lighting System Network.

I. System Setup
1. A setup menu shall be provided with the processor. This menu shall be accessed using the control module input terminal of the dimmer bank control module. This menu shall provide basic setup functions.
2. A configuration program shall be provided for setup and programming of any size system. All functions of the system may be configured and monitored using this program.
3. Installation shall include programming basic operations as directed by the Owner or Architect's Consultant. Programming files shall be provided to the Architect's Consultant on USB flash drive so that the Architect's Consultant may retain a copy for their records.

J. Acceptable House Light Control Systems:
1. Electronic Theatre Controls, Inc.: Unison Paradigm

K. Quantities:
1. Auditorium - Quantity: One (1)

2.5 ENTRY PANEL "EP-(X)" (HOUSE AND WORKLIGHT REMOTE CONTROL)

A. EP-1: "Entry Panel" station with one button shall have the following functions and features:
1. Control shall be accessed through one (1) soft push button that shall be used to turn "on" and "off" one (1) user programmable preset.
2. Shall have a LED to display when a preset is on. LED color shall be programmable.
3. Shall mount in single-gang box.
4. Shall have no less than one preset.

B. EP-2: "Entry Panel" station with two buttons shall have the following functions and features:
1. Control shall be accessed through two (2) soft push button that shall be used to turn "on" and "off" two (2) user programmable presets.
2. Each push button shall have an LED to display when a preset is on. LED color shall be programmable.
3. Shall mount in single-gang box.
4. Shall have no less than two (2) presets.

C. EP-3: "Entry Panel" station with three buttons shall have the following functions and features:
1. Control shall be accessed through three (3) soft push button that shall be used to turn "on" and "off" three (3) user programmable presets.
2. Each push button shall have an LED to display when a preset is on. LED color shall be programmable.
3. Shall mount in single-gang box.

4. Shall have no less than three (3) presets.

D. EP-4: “Entry Panel” station with four buttons shall have the following functions and features:
1. Control shall be accessed through four (4) soft push button that shall be used to turn "on" and "off" four (4) user programmable presets.
2. Each push button shall have an LED to display when a preset is on. LED color shall be programmable.
3. Shall mount in single-gang box.
4. Shall have no less than four (4) presets.

E. EP-5: “Entry Panel” station with 5 buttons shall have the following functions and features:
1. Control shall be accessed through five (5) soft push button that shall be used to turn "on" and "off" five (5) user programmable presets.
2. Each push button shall have an LED to display when a preset is on. LED color shall be programmable.
3. Shall mount in single-gang box.
4. Shall have no less than five (5) presets.

F. EP-F - "Fader Preset Station" shall have the following functions and features:
1. Control shall be accessed through five (5) soft push buttons that shall be used to turn "on" and "off" one (1) each user programmable preset or master-preset.
2. Shall have one (1) fader to control the level of one (1) programmed preset. “Off” shall trump the fader setting. “On” shall return the preset to the proportionate level set by the fader.
3. Shall have a LED to display when a preset or divider is on.
4. Shall mount in one-gang box.
5. Shall have no less than three presets.
6. See drawings for quantity of fader sliders and preset buttons and other functions to be included in the Fader Preset Station.

G. EP-K: “Entry Panel-Keyed” station shall have the following functions and features:
1. Control shall be accessed through one (1) keyed switch which shall be used to turn "on" and "off" one (1) user programmable preset or master-preset.
2. Key switch shall be momentary type.
3. Shall have a LED to display when a preset is on. LED color shall be programmable.
4. Shall mount in single-gang box.
5. Shall have no less than one preset.
6. See drawings for other functions such as faders or preset buttons to be included in the Entry Panel-Keyed Station

H. EP-M: "Master Station" shall have the following functions and features:
1. A backlit liquid crystal display with a graphic touch screen user interface which shall show preset names, respective levels expressed as a percentage, operating instructions, fade times in one second increments, clock and calendar settings, lock mode status, station mirroring status, auxiliary closure names, have the ability to page or scroll up and down to reveal information, and have adjustable levels of intensity.
2. Memory shall be stored in non-volatile electronic memory.
3. Control shall be accessed through graphic buttons and faders. Control page will allow for the control, selecting and editing of presets.
4. Shall be capable of displaying current date and time.
5. Shall be capable of setting the correct time and date within the system.
6. Shall have screen size of 7” to 18” on diagonal.
7. See drawings for other features such as faders or preset buttons to be included in the Master Station.

I. EP-P: “Portable Master Station”

1. A backlit liquid crystal display with a graphic touch screen user interface which shall show preset names, respective levels expressed as a percentage, operating instructions, fade times in one second increments, clock and calendar settings, lock mode status, station mirroring status, auxiliary closure names, have the ability to page or scroll up and down to reveal information, and have adjustable levels of intensity.
2. Memory shall be stored in non-volatile electronic memory.
3. Control shall be accessed through graphic buttons and faders. Control page will allow for the control, selecting and editing of presets.
4. Shall be capable of displaying current date and time.
5. Shall be capable of setting the correct time and date within the system.
6. Shall have screen size of 7” to 18” on diagonal.
7. Shall be a portable, plug in device with a twenty-foot (20’) cord
8. See drawings for other features such as faders or preset buttons to be included in the Portable Auxiliary Master Station.
9. Size per Drawings
10. Plug-in Stations are indicated on the TL drawings as “Portable Master” and shall serve as receptacles for the Portable Master Station

J. EP-T: “Entry Panel-Touch screen” station shall have the following functions and features:
1. A backlit liquid crystal display with a graphic touch screen user interface which shall show preset names, respective levels expressed as a percentage, operating instructions, fade times in one second increments, clock and calendar settings, lock mode status, station mirroring status, auxiliary closure names, have the ability to page or scroll up and down to reveal information, and have adjustable levels of intensity.
2. Memory shall be stored in non-volatile electronic memory.
3. Control shall be accessed through graphic buttons and faders. Control page will allow for the control, selecting and editing of presets.
4. Shall be capable of displaying current date and time.
5. Shall be capable of setting the correct time and date within the system.
6. Size per Drawings.

K. Entry Panel LED indicator light with multi-color capacity:
1. See drawings for LED color for various modes and conditions. If no LED color is indicated in the drawings then the following shall apply:
   a. LED amber in LOCKOUT mode
   b. LED at 50% red in OFF mode
   c. LED at 100% green in ON mode

L. Acceptable Entry Panel (House and Worklight) Remote Control Stations:
1. Electronic Theatre Controls, Inc.: Unison Paradigm
2. Vari-Lite: Vision.net
3. Acceptable substitution

M. Quantity: As shown on drawings
1. Plus Portable Master Stations. per below:
   a. Auditorium: - Quantity: One (1)

2.6 STAGE LIGHTING CONTROL CONSOLE (AUDITORIUM)

A. Specifications
1. DMX Outputs: 12,288
2. Control Channels: 32,768
3. Encoders: 4
4. Touchscreens: 2
5. Removable Media recording for show file storage
6. 24 Submaster Faders with bump buttons and status-indicating LEDs

7. Live Real-Time Tracking Backup Processing

B. Console shall include:
1. One (1) high-resolution 19” LCD flat screen color.
2. Two (2) Removable Media for show file storage.
3. One (1) set of 25-foot control cables terminating in locking connectors appropriate for mating with the Control Receptacle Panel.
a. Connectors shall be Neutrix EtherCon or equivalent.
4. Vinyl dust covers for the console and video displays.

C. Acceptable products.
1. ETC Ion Xe -12K

No other system shall be considered unless specifically approved by the Theatre Consultant at least 10 days prior to bid date.

D. Install in the Control Booth as shown in the Drawings.

2.7 SPOT LIGHT CONTROL SYSTEM (ROBO SPOT CONTROL SYSTEM)

A. Specifications
1. 15.6" monitor
2. QVGA Robe touch screen with battery backup
3. 4 control jog-wheels
4. 10 preset buttons with a direct access of the pre-programmed features
5. Activation button
6. Pan & Tilt freeze buttons
7. 2 faders mounted on the handles with direct control of the key features 0-100% (for example dimmer and iris), assignable to any fixture properties (focus, zoom, frost, etc)
8. Manual movement control with position indication on the screen
9. User setting of controllable attributes
10. Saving and uploading of custom settings
11. Compatible with: FORTE FS
12. One RoboSpot can control up to 12 fixtures

B. Controller shall include:
1. Monitor Shield and Note Holder II for RoboSpot BaseStation
2. Water-resistant RoboSpot system protection cover
3. Two (2) sets of 25-foot control cables terminating in locking connectors appropriate for mating with the Control Receptacle Panel.

C. Acceptable products.
1. Robo Spot Control System

No other system shall be considered unless specifically approved by the Theatre Consultant at least 10 days prior to bid date.

D. Install in the Spot Light Operator Room as shown on drawings

E. Quantity: Two (2)

2.8 CONTROL ACCESSORIES

A. Uninterruptible power supply. Capable of sustaining operating voltage to control console and CRT(s) for up to 10 minutes in the event of a loss of power. Capable of filtering spikes, surges, and noise from power source. Conditioner shall provide continuity of earth ground from source to the console. Shall include test switch to confirm battery charge. UPS shall be sized to provide rated power supply for control console, Monitors, and any console-mounted work light.
1. UPS shall be NRTL listed.

2. General warrantee shall be for 3 years parts and labor. Battery shall be warrantied for a period of not less than 2 years and shall be field replaceable without the use of tools.
3. Input power shall be 120VAC/60Hz.
4. Output power shall be a nominal 120VAC via NEMA 5-20 receptacles.
5. Transfer time between utility power and battery, and between battery and utility power, shall not exceed 4ms.
6. UPS shall have the capability to be IP enabled.
7. Maximum audible noise shall be less than 27db at 1 meter.
8. Approved manufacturers, Rack Mounted UPS:
   a. Middle Atlantic, Series UPS-1000x/2200x depending on load.
   b. Tripp-Lite, SmartPro Series, sized for load
   c. Approved substitution.
9. Approved manufacturers, Desktop UPS (provide one UPS for each console provided):
   a. Eaton, Series 5Sx, sized for load.
   b. Cyber-Power, Series AVR
   c. Tripp-Lite, SmartPro Series, sized for load
   d. Approved substitution

B. Wireless Handheld Remote. Provide Wireless Hand-held remote control. Capabilities to call up channels, adjust levels, call up cues, run cues, and perform dimmer check. Provide transmitter and all access points required for a complete and functioning system. System shall provide for continuous operation from all points within the auditorium and stagehouse including but not limited to the gridiron, stage floor, dimmer room, auditorium catwalks, control rooms, and auditorium.

2.9 MOTORIZED BREAKER PANELS (DMX CONTROLLED)

1. Panels and Breakers
   a. The panel shall be constructed of 16-gauge galvannealed steel. All panel components shall be properly treated or finished in fine-textured, scratch resistant paint.
   b. Panels shall be surface mounted. Faceplates shall not extend beyond the edges of the back box.
   c. Breaker Panels shall consist of a main enclosure with 24, or 48 pole breaker subpanels, integral control electronics for low voltage terminations and provision for a minimum of three accessory cards.
   d. Breakers shall be available in one, two, or three poles, from 15-amp to 30-amp. Breakers shall be listed for 100% continuous use without derating. Breakers shall provide manual switching control and shall be allowed to be combined within a single panel.
   e. Breaker Panels shall be UL508, UL67, and UL924 Listed, and shall be so labeled when delivered.
   f. Breakers shall be UL489 listed and shall be labeled when delivered. Output lugs shall support solid or stranded 6-14 AWG class B, C, or K, copper wire.
2. User Interface
   a. The user interface shall contain an LCD display with button pad to include 0-9 number entry, up, down back arrow navigation and enter.
   b. Test shortcut button shall be available for local activation of preset, sequence and set level overrides.
   c. The user interface shall have a power status LED indicator, a DMX status LED indicator, a network status LED indicator, and an LED indicator for errors.

d. Interface shall allow the backlight to timeout and shall provide user editable options to shut off backlight completely as well as adjust screen contrast.
e. Ethernet interface (when installed) shall default to automatic IP through link local and DHCP. Upon receiving IP address, the address of the Network Interface Card (NIC) shall display in the about menu. Static address and settings shall also be possible.
f. The control interface shall support a USB memory stick interface for uploads of configurations and software updates.

3. Functional
a. Panel setup shall be user programmable. The control interface shall provide the following breaker setup features (per circuit):
b. Type (1 pole, 2 pole, or 3 pole)
i. Name
ii. Circuit Number
iii. DMX address
iv. sACN address (network enabled panels only)
v. Space Number
vi. Circuit Modes
vii. Normal (priority and HTP based activation)
viii. Latch-lock
ix. Fluorescent
x. DALI
xi. On threshold level
xii. Off threshold level
xiii. Include in UL924 emergency activation
xiv. Allow Manual
c. Breaker panels shall support discrete addressing of each breaker. Panels that are restricted to use of start address with sequential addressing, and cannot assign each 0-10V output control to any internal circuit shall not be acceptable
d. The panel shall be capable of switching 6 poles on or off at once, or in a user-selectable delay per breaker using a period of 0.1 to 60 seconds, in 0.1 second increments
e. Control electronics shall report the following information per branch circuit:
i. Breaker state (On/Off)
ii. Breaker state (Open/Closed)
iii. Current draw (In Amps)
iv. Voltage
v. Energy usage
f. Built in Control shall include:
i. Ability to record up to 16 presets in each space from the control panel, connected control stations, or timed events.
ii. Presets shall be programmable by recording current levels (as set by DMX or connected control stations), by entering levels on the control panel directly, manually selecting breaker state on each breaker, or a combination of these methods. From the control panel, stations, or timed events it shall be possible to record values for up to 16 zones per space.
iii. Up to 8 spaces in a single rack for total of up to 16 spaces shall be supported per system or system subnet.
iv. Indication of an active preset shall be visible on the control panel display.
v. One 16-step sequence per space for power up and power down routines.

vi. The panel shall have a UL924-listed contact input for use in Emergency Lighting systems. The panel shall respond to the contact input by setting included breakers to “on”, while setting non-emergency breakers “off”. Each breaker can be selected for activation upon contact input.

vii. Upon Data loss the system shall provide options to hold last look infinitely or hold for a configured time period set by the installing technician then fade/switch to the input of the next available priority.

viii. Control electronics shall respond directly to control stations for zone, preset, and sequence control. Systems that require secondary control systems for this functionality are not acceptable.

ix. After power loss, electronics shall be capable of holding the system in its previous state until new level data (DMX, architectural presets, sequences and zones, or local overrides) is received to make each breaker change state.

g. The control of lighting and associated systems via timed and Astronomical clock controls.

i. The breaker panel shall allow the activation of presets, sequence, and zone programming of up to 50 time clock events via a built in real and astronomical time clock.

ii. System time events shall be programmable via the control panel

a) Time clock events shall be assigned to system day types. Standard day types include: everyday, weekday, weekend, Sunday, Monday, Tuesday, Wednesday, Thursday, Friday and Saturday

b) Time clock events shall be activated based on sunrise, sunset, time of day or periodic event

c) System shall automatically compensate for regions using a fully configurable daylight saving time

d) Presets shall be assigned to events at the time clock

iii. The time clock shall support event override

a) It shall be possible to override the timed event schedule form the face panel of the time clock

iv. The time clock shall support timed event hold

a) It shall be possible to hold a timed event from the face panel of the processor

b) Timed event hold shall meet California Title 24 requirements

h. The panel shall receive ESTA DMX512-A control protocol. Addressing shall be set via the user interface button keypad with any circuit patched to any DMX control address

i. 2,500V of optical isolation shall be provided between the DMX512 inputs and the control electronics as well as between control and power components

ii. The breakers shall respond to control changes (DMX or Stations) in less than 25 milliseconds. DMX512 update speed shall be 40Hz

iii. Setting changes shall be able to be made across all, some, or just one selected breaker in a single action from the face panel

iv. DMX data loss shall allow for levels/breakers to be held for ever or for a specified time before switching to a lower priority source

v. Initial Panel setup
  a) The breaker panel shall automatically detect the type of breaker or dimmer installed in each location without need for manual configuration of the physical arrangement
  b) Quick rack setup shall be available to apply address settings across all circuits for rack number, DMX Start Address, sACN universe, and sACN start address
  c) Emergency Setup Menu shall provide optional delays when emergency is activated or deactivated, and option to turn off non-emergency circuits shall be available. Record function shall allow circuits that are turned on to be added to the emergency setting.

4. Electrical
  a. Breaker Panels shall be available to support power input from:
    i. 120/208V three phase 4-wire plus ground, as indicated in the drawings.
    ii. 2 40/277V single phase 3-wire plus ground, as indicated in the drawings.
  b. Conduit Entry:
    i. Feeders:
      a) Top or upper 6” of either side.
      b) Bottom or lower 6” of either side.
      c) Feeders shall enter through the top or bottom according to the orientation of the enclosure.
      d) Feeder entry shall be nearest to the location of the feeder lugs or main breaker.
  c. Load Wiring:
    i. Load wiring shall enter through the top or bottom of the enclosure through the surface nearest to the breaker sub panel.
    ii. Load wiring may also enter through left and/or right side provided a low voltage chase is not required through the same area. If class 2 chase is required, a field installable barrier panel shall be provided upon request. The side of the panel where the barrier has been installed shall not permit load wiring.
  d. Low Voltage:
    i. Top or upper 6” of either side.
    ii. Bottom or lower 6” of either side.
    iii. For low voltage conduit entry at the breaker end of the cabinet, conduits shall be located at the outer 3” of the top/bottom panel.
  e. Breaker
    i. Bus connection type: Stab on
    ii. 1, 2, or three poles
    iii. UL489 listed
    iv. 15 amp, 20 amp, or 30 amp
    v. 22,000 SCCR on 120/208V breakers, and 14,000 SCCR, up to 20A, 10,000 SCCR for 30A on 240/277V breakers. 65,000A series rated with main breaker shall be available.
    vi. High inrush trip curve
    vii. Maintains trip curve through entire thermal range
    viii. Guaranteed not to trip at full load
    ix. Load lugs accept 6-14awg load wiring
    x. Multi-conductor listed output terminal
    xi. Integral mechanically held air gap relay
    xii. Manual control of relay state using breaker handle w/o power
    xiii. Integral current sensing
    xiv. Integral position and trip sensing

xv. Control and status provided by contact pads directly at bottom of the breaker case
xvi. No external wires or connections required for control or feedback
xvii. The breaker shall be capable of switching up to 30A

f. The breaker panel shall support a maximum feed size
i. 100 Amps at 12 circuits
ii. 200 Amps at 24 circuits
iii. 400 Amps at 48 circuits

g. Breaker panels shall support main circuit breaker options:
i. Main breaker options shall be optional and available for purchase upon request
ii. Main breakers shall be field installable
iii. Main breakers shall be available in up to 100 Amps for 12 circuit panels, up to 200 Amps for 24 circuit panels, and up to 400A for 48 circuit panels at 120V.
iv. Series SCCR ratings apply as follows with appropriate main breaker:
v. 22,000A or 64,000 at 120/208V
vi. Main breakers shall allow the following range of wire sizes:
vii. Up to 300kcmil at 100A and 200A
viii. Up to 2x250kcmil at 400A
ix. Main Lug input shall support up to 2x250kcmil
x. Breaker panel shall support a 500kcmil main lug option for 48-circuit panels

h. Breaker remote switching ratings
i. Mechanical 1,000,000 cycles
ii. 24A Resistive 100,000 cycles
iii. 16A Ballast (HID) 75,000 cycles
iv. 15A Electronic (LED) 100,000 cycles
v. 15A Tungsten 45,000 cycles
vi. 30FLA; 180 LRA Motor Load 50,000 cycles
vii. Tested duty cycle: 12 operations (6 cycles) per minute
viii. Decreasing duty cycle significantly increases switch life
ix. Isolation: 4000V RMS
x. Current reporting accuracy: 5%
xi. Latching state mechanical relay

i. Breaker Panel Accessories
i. An Ethernet option shall provide advanced control of relays over streaming ACN (sACN) and transmit status, control override, and measured energy usage per branch circuit to a web browser based or central monitoring interface
ii. A low voltage 0-10V dimming option shall provide up to 24 0-10v control outputs that are linked to relay circuits within the panel. Each output shall support up to 400mA of current sink per output
iii. A contact input option shall provide 24 dry contact inputs to be linked for direct or group relay control, to activate a preset, or to activate a sequence. Controller software shall allow for normally open maintained, normally closed maintained, or momentary toggle
iv. A DALI control option shall provide 24 control loops of broadcast DALI control, with each loop controlling up to 64 DALI devices
v. A RideThru option shall provide short-term power backup of control electronics by automatically engaging when power is lost, and recharging when normal power is present

vi. An Isolated Ground option shall provide each circuit in the panel with a ground terminal that is electrically isolated from the equipment ground
vii. Main Breaker options shall be available as shown in Section E.4

j. Thermal
i. The panel shall be convection cooled.
ii. The panel shall operate safely in an environment having an ambient temperature between 32ºF (0ºC) and 104ºF (40°C), and humidity between 5-95% (non-condensing)

k. Acceptable Products:
i. Sensor IQ, by ETC
ii. LCP Series, by LynTec

2.10 CONTROL WIRE

A. Control wire shall be provided in quantity required.

B. Provide the type of control wire as directed by system manufacturer(s).

C. Provide all network wiring to follow Category 5 installation guidelines and protocols as prescribed under this section.

D. Wiring methods
1. All permanent network wiring shall terminate in receptacles in panels. All equipment shall be connected to receptacles via "patch cables" with RJ45 plugs. No installed wire shall terminate directly to network equipment. The use of male RJ45 pigtails shall not be permitted.
2. Cable shall be pulled in conduits, meeting the minimum bending radius permitted by the cable manufacturer. All cable shall be pulled with no more than the maximum pulling tension permitted by the cable manufacturer.
3. Riser rated or plenum rated cable shall be used where required under local codes.

E. Electrical requirements
1. All UTP wiring segments shall be of continuous runs of not more than 250 feet. If a wiring run exceeds the noted maximum footage, manufacturer shall provide required repeaters and system elements to bring the segment wiring to the stated maximum run. Contractor shall provide and install such elements as part of the work of this Section.
2. All cable shall meet the standards for EIA/TIA 568 TSB-36 Category 5. The Contractor shall use a current generation 100Mhz or higher, network/cable analyzer to perform testing on the cable plan and shall test all data pairs. All cable shall be tested for continuity, attenuation, near end crosstalk, mutual capacitance, cable impedance, cable resistance, cable length, structural return loss and pair mapping. All testing will be performed by certified cable technicians. As part of the final submittal, provide cable analyzer printouts of all test performed, labeled by cable number.
3. All wiring shall meet the EIA/TIA T586B wiring standard.
4. All cable and installation shall accommodate 100Mbs transmission rate. "Thin Net" systems shall not be used.
5. The system shall be designed for maximum 40% traffic utilization and maximum 10% collisions within the same collision domain. The use of switches is acceptable to manage network traffic.
6. All Layer 2 switches shall provide for IGMP Layer 3 snooping to accommodate IP multicast events.

F. Network cables and patch cables
   1. Cables shall be rated Category 5 to match wiring of installed wiring.
   2. Cables shall include RJ45 plugs at each end, for proper mating to receptacle panels and node devices. Each cable shall be protected by a rubber boot of a diameter sufficient to extend beyond the plug connection tab.
   3. Patch cables and boots shall use multiple colors to differentiate collision domains. Drop cables and boots (cables 10' long or more) shall be black.

G. Quantities sufficient to patch all receptacle panels. In addition to scheduled quantities.

2.11 CONTROL RECEPTACLE PANELS

A. The Control Receptacle Panels shall be mounted as indicated in the Drawings, dead front, and completely wired internally, with terminal strips of the proper rating for all external connections.

B. The face of the panels shall contain flush mounted receptacles. These receptacles shall be of the locking type and shall be sized for the proper number and capacity of conductors as indicated in the Drawings. Control connectors shall be equal to 4-pin or 5-pin XLR, Switchcraft D4M or D5M. All Category 5 connectors shall be RJ45 EtherCon (by Neutrik or approved equal). All fiber optic connectors shall be ST style connectors. Smaller or less substantial connectors shall not be acceptable.

C. The face of each panel shall contain receptacles as indicated in the Control Device Schedule.

D. Engraved Lamicoid labels with the following information shall be mounted beside each receptacle wired with Category 5 network wire, per the Drawings.
   1. Panel designation
   2. Title of "Lighting Network"
   3. Designation of wire destination
   4. Maximum length of patch cable permissible from the receptacle.

E. Install as shown in the Drawings.

2.12 PORTABLE CONTROL RECEPTACLE PANELS

A. Portable control receptacle panels (CRP) shall be for the connection of equipment at receptacle panels.

B. Nodes shall have receptacles for connection of network cables as well as for connection of other equipment to which, the portable CRP is designed to interface.

C. Portable CRP’s shall be compatible with Power over Ethernet powering schemes.

D. Devices shall be provided with mounting bracket, C-clamp, and safety cable. Devices and accessories shall be black unless otherwise noted.

E. Portable CRP’s shall have the required number of ports as indicated in the device schedule.

F. Quantities:.
   1. Theatre:
      a. (6) with 2 DMX Outputs
      b. (1) with 1 DMX-IN, 1 DMX-Out
   2.

G. Deliver to Owner.

2.13 NETWORK DATA SYSTEMS

A. The Network Data Systems shall provide for the interconnection of devices used solely for stage lighting and special effects.

B. The network shall consist of receptacle panels, connecting wiring, patch bay(s), patch cables, hub devices, routers, switches, DMX/Ethernet nodes, and receptacle panels for portable node devices.

C. All materials, components, and services necessary to provide complete network data systems indicated in this Section. Manufacturer shall be responsible for performance of the complete system.

D. All control devices shall operate as part of the network. If the manufacturer's system requires devices that are not network compatible, manufacturer shall provide all required hardware to accommodate those devices to meet the intent of this specification. Contractor shall provide and install all conductors to accommodate these devices, as part of the work of this Section.

E. The network shall provide for the connection of the following devices as well as dedicated non-network "dry lines" as noted:
1. Control Consoles
   a. DMX: non-network dedicated lines to dimmers (Theatre network only)
   b. DMX out (network – via Ethernet)
   c. Dimmer feedback information
2. Remote video displays
3. Designer's remote control consoles
4. Automated spotlights
5. Color changers
6. Moving yoke devices
7. DMX-controlled special effects

F. Network capacity shall be determined by the following simultaneous usage criteria. System shall allow all the data below to be sent simultaneously, within the traffic and collision maximums noted above.
1. Control Consoles – quantity two (2)
   a. DMX out: network usage to dimmers
   b. Dimmer feedback information
2. Remote video displays – quantity two (2) in use, in two separate locations
3. Designer's remote control consoles – quantity one (1)
4. Wireless remote controls
   a. Network signal for one (1) unit
5. Distributed DMX signal – two (2) 512-dimmer universes

G. All system elements shall be provided from a qualified network hardware manufacturer. The manufacturer shall have at least five (5) years experience in the fabrication of network hardware. Subject to the above requirements, the equipment indicated herein shall be by one of the following manufacturers:
1. Allied Telesis
2. Nortel
3. Cisco Systems
4. Hubbell Premise
5. Panduit

H. Data Distribution Panel(s) and Signal Processing Rack(s)
1. The System shall utilize central panel(s) for patching and distribution. The Panel(s) shall be surface wall mounted and completely wired internally. Design and configuration as shown in the Drawings.
2. Patch panel(s) shall include sufficient patching for all network receptacles, plus six (6) spare receptacles.

3. The Panel(s) shall be 19" equipment mounting rack(s) with a hinged front door. Panel shall include hinged “swing-away” mounting for rear access.
4. The Panel(s) shall include wire management panel(s) as manufactured by Panduit or approved equal.
5. All wires shall be permanently identified at the jacket at each end per Division 26 requirements.
6. Each port in patch panels shall be labeled in a logical order with the name of the connected device as indicated in the Drawings.
7. The Panel(s) shall include UPS protection and surge protection for all devices requiring a power source - Best Devices or approved equal.

2.14 CENTRALIZED DMX DISTRIBUTION

A. The system described below is based upon general performance criteria common to the products listed below. No other system shall be considered unless specifically approved by Theatre Consultant at least ten (10) days prior to the bid date:
1. Electronic Theatre Controls “Net3 Four Port Gateway.”
2. Pathway Connectivity “Pathport Quattro Node.”
3. Pathway Connectivity “Pathport Octo Node.”

B. The Centralized DMX Distribution system shall be located at the Signal Processing Rack and employ the above noted device(s). The system shall provide for the translation of network control data into discrete DMX512 data streams to the indicated receptacles on the Control Receptacle Panels, per the drawings and schedules. The system shall be designed with the following functionality:
1. The device(s) shall be capable of accepting the following lighting control network data: ACN; sACN; RDM; ETC Net3.
2. The device(s) shall use a dedicated multiplexed signal conforming to the ANSI E1.11 – 2008 (R2013) DMX512-A standard.
3. DMX512 data streams shall be optically isolated.
4. Each discrete DMX512 data stream shall be programmable to provide data within the specified DMX512 Universe(s).

C. Wiring between Centralized DMX Distribution system devices and indicated receptacles on the Control Receptacle Panels, per the drawings and schedules, shall:
1. Utilize Category 5E cable for transmission of DMX512 data.
2. Cable length shall be limited to 250 feet.
3. Follow all recommended practices, unless otherwise noted above, of ANSI E1.27-2 - 2009 (R2014) – Recommended Practice for Permanently Installed Control Cables for Use with ANSI E1.11 (DMX512-A) and USITT DMX512/1990 Products.

D. All wires shall be identified at the jacket with separate numbers.

E. The device(s) shall provide one discrete input or output for each DMX receptacle in the system plus four (4) spare inputs/outputs. Provide rear-mounted terminals for the connection of all DMX wiring.

F. Multiple DMX receptacles on a single input or output cable shall not be accepted.

G. Install in the Signal Processing Rack.

2.15 DISTRIBUTED DMX DRIVER

A. The Control Interface Rack shall include an optically isolated distribution device capable of providing discrete DMX512 signals. The device(s) shall be rack-mounted and provide discrete DMX control lines to the indicated Control Receptacle Panels and to the dimmer racks.

B. All wires shall be identified at the jacket with separate numbers.

C. The device(s) shall use a dedicated multiplexed signal conforming to the ANSI E1.11 – 2008 (R2013) DMX512-A standard.

D. The device(s) shall provide one discrete output for each DMX output receptacle in the system plus four (4) spare outputs. Provide terminals for the connection of all DMX wiring.

E. Manufacturer: Pathway Connectivity or approved equal.

F. Install in the Signal Processing Rack.

2.16 0-10V CONTROL GATEWAY

A. General
1. The lighting control gateway shall be a microprocessor-based unit specifically designed to provide 0-10V control for lighting systems. The gateway shall permit DMX-512 and Ethernet Data to be received and converted to 0-10V control outputs.
2. Gateways shall communicate over DMX and Ethernet to the Theatre Lighting Control System.
3. The gateway shall support an input for use in Emergency Systems
4. The gateway shall be NRTL Listed, RoHS Compliant, and CE compliant.
5. The gateway shall have a backlit display for identification (soft-labeling), status reporting and configuration.
   a. Labeling shall be user configurable using ANSI E1.17 Architecture for Control Network (ACN), or a purpose built software configuration tool.
   b. The display shall show gateway configuration and indicate the current input and output levels.
6. Each gateway shall have power and network activity indicators on the front of the gateway

B. Processor
1. Maximum delay time from input to output shall not be greater than one packet time (approximately 22 mSec.).
2. A minimum DMX update rate of 40Hz shall be sustained under all conditions unless specifically configured for a slower rate for the sake of compatibility with DMX devices.

C. Electrical
1. The gateway shall provide (24) 0-10V outputs.
2. Each supporting voltage source or sink
3. Each output shall have a 50mA maximum current
4. DMX Ports
   a. DMX Ports shall comply with the requirements of ANSI E1.11 USITT DMX512-A standards.
   b. DMX input shall be optically-isolated from the gateway electronics.
   c. DMX output shall be earth-ground referenced.
   d. DMX Port shall be capable of withstanding fault voltages of up to 250VAC without damage.
5. Power shall be provided by a low-voltage DC power input utilizing an isolated in-line power supply capable of an operating range of between 18-28vDC.
6. The Input for Emergency Systems shall support:
   a. A dry contact input shall provide triggering of an emergency condition
   b. A three position switch shall set the input as Normally Open (NO) Normally Closed (NC), or Off
7. All relevant configuration information shall be stored in non-volatile memory at each gateway. The system shall recover from a power outage without requiring reconfiguration.

D. Acceptable products:
1. “Response Gateway” as manufactured by Electronic Theatre Controls.
2. Approved equal

2.17 RECEPTACLE DEVICES AND ACCESSORIES

A. Each electrical device shall be approved by a Nationally Recognized Testing Laboratory (NRTL), shall be currently listed by NRTL and shall, when furnished and installed, bear a factory affixed NRTL label.

B. All steel parts and panels shall be cleaned and primed with rust-inhibiting primer. Exterior finishes shall be epoxy resin or baked enamel anodized in matte black, on in Manufacturer’s standard color where not specified.

C. All plug strips and outlet boxes shall be supplied with stage pin connectors equal to Union 2P&G on 18" pigtails and **clear covers** except where otherwise noted. Circuit numbers to be applied in bright yellow, 2" high format at each receptacle in non-removable permanent fashion.

D. Gridiron and plug strip junction boxes shall be provided with terminal strips as required for number of wires shown plus ground terminal.

E. Provide woven wire supports on all devices connected to portable cable (SO) including, but not limited to gridiron junction boxes, batten-mounted plug strips, border lights, and hanging plug boxes. Woven wire supports installed in gridiron junction boxes shall be installed in the bottom of the box, rather than the side.

F. Pantographs
1. Provide one pantograph for each orchestra shell ceiling Lineset. (Total three (3), per drawings.)
2. Cable housing shall be black extruded aluminum.
3. System shall utilize flat multi-cable.
4. Shall attach to top of rigging pipe batten.
5. Shall be long enough to allow full pipe travel.

G. Quantity: As shown on drawings

2.18 WIRING DEVICES

A. General Requirements
1. All device number and letter labeling shall be provided with matching character fonts.
2. 20-ampere pigtails shall be 12-3 type S cord, length per Drawings, secured by cushioned strain reliefs or nylon "Heyco" bushings.
3. 50-ampere pigtails shall be 6-3 type S cord, length per Drawings, secured by cushioned strain reliefs or nylon "Heyco" bushings.
4. Connectors for circuits other than standard 20-amp stage circuits shall have covers that correspond to the label color.
5. Device labeling
   a. Plug Strips circuit numbers shall be painted onto both sides of the wireway in letters not less than 1-1/2 inches high, using white epoxy paint for standard 20-amp stage circuit numbers and epoxy paint, color as noted, for all other numbers per the Drawings.
   b. Circuit numbers on all other devices shall be engraved into the face plate in letters not less than one inch high and filled with white epoxy paint for standard stage circuit numbers and epoxy paint, color as noted, for all other numbers per the Drawings.
6. All multi-pin receptacles shall include a removable threaded cover with retaining chain.

7. Receptacle configuration as shown in the Drawings.
8. Exterior finish shall be flat black baked enamel (for steel) or black anodized (for aluminum) unless noted otherwise.
9. Devices with multiple voltages shall provide continuous voltage barriers separating each voltage. Device shall also bear a warning label indicating multiple power sources are supplied to the device.
10. All components requiring external electrical connections of more than eight (8) conductors shall include barrier-type terminal strips properly sized and permanently labeled. For drop boxes the terminal strips shall be sized to accept a range of wire from #10 to 12. For all other devices the terminal strips shall be sized to accept a range of wire from #12 to #6.
11. Units shall be UL listed and carry a UL label.

B. Plug strips
1. Plug strips shall be mounted as shown in the Drawings and constructed of 18 gauge steel or extruded aluminum.
2. Overall construction of wireway and associated terminal block shall not exceed twenty-four (24) inches in height.
3. Mounting brackets shall be constructed of min. 1-1/2" wide 7-gauge steel, as shown in the Drawings. Provide sufficient mounting brackets to support plug strips min. 5'-0" O. C., plus additional mounting brackets as required for specific conditions.
4. Plug strips shall be shipped as folded segments for ease of installation. Maximum segment length shall be 8’-0”.

C. Plug boxes
1. Plug boxes shall be constructed of 16-gauge steel or extruded aluminum. Knockouts shall be provided on all sides of the back box.

D. Floor pockets
1. Floor pockets shall be flush floor mounted, with a hinged access cover. Cover plate shall be 3/8" thick cast iron, with cast-in non-skid gridding in the top and at least one cable notch for each receptacle. The back box shall be constructed of 20-gauge steel, with knockouts provided in the bottom and on all sides. Receptacles shall be mounted on a 20-gauge steel plate angled for visibility and access.
2. Provide a dust flap for each faceplate. Dust flap shall be min. 1/8" sheet neoprene, commercial grade. Flap shall be sized to completely cover all receptacles, shall be permanently attached to the top of the faceplate, and shall be slit once between each receptacle. Dust flap shall be designed and constructed to protect the receptacles from dust when not in use and to be peeled back to allow a cord to be plugged into a receptacle. Paint circuit numbers onto dust flap segments in letters not less than 1 inch high.

E. Drop boxes
1. Drop boxes shall be portable, entirely enclosed, and constructed of 16-gauge steel or extruded aluminum. End plates shall be filleted to prevent any sharp edges. The bottom shall contain two C-clamps and one load rated eyebolt with 11/16” i.d. eye for attachment to pipe batten. The offstage side shall contain "Kellems" type mesh grips to support the entrance of the multi-conductor cable.

F. Gridiron junction boxes
1. Gridiron junction boxes shall be constructed of 20-gauge steel.
2. Exterior finish shall include safety yellow stripes.
3. Access shall be by means of a removable cover plate. Knockouts shall be provided in all sides for contractor wiring and multi-conductor cables.
4. Each flexible cable entry shall have a "Kellems" type mesh grip attached to the box.

G. Multi-conductor cables
1. Cables shall be rated at 600 volts, minimum 90 degrees Celsius, with two (2) conductors for each 20-ampere circuit required plus one grounding conductor for every three (3) circuits.
2. Permanently installed cables shall be cord type SC or SO.
3. Portable cables shall be cord type SC.
a. Approved Manufacturers:
i. “Pro Cable” as manufactured by TMB, Burbank, CA.
ii. “PowerFlex” as manufactured by LEX Products, Stamford, CT.
iii. Coast Entertainment, a division of Coast Wire & Plastic Tech, Inc., Carson, CA
iv. or approved equal.
4. Wire size shall be minimum #12 AWG, or larger as code requirements dictate.
5. Sizes and lengths as indicated in the Drawings and schedules.

H. Cable cradles
1. Cradles shall be constructed of cast iron, with grooves and clamps sized to the number and diameter of multi-conductor cables.
2. Provide and install one (1) per multi-conductor cable, as indicated in the Drawings.

I. Cable clamps
1. Cable clamps shall hold multi-conductor cables at the batten, before they enter the plug strip and as otherwise shown in the Drawings.
2. Provide and install one (1) per multi-conductor cable per plug strip.

J. Locations, quantities, sizes and circuits as shown in the Drawings.

K. Install as shown in the Drawings.

2.19 STAGE LIGHTING CONNECTORS

A. Twist-lock
1. 20-Ampere devices
a. Connectors shall be 20 ampere, 2 wire plus ground, locking, with nylon bodies and casings, and integral cable clamp. Configuration shall be NEMA L5-20.
b. The following manufacturer’s devices shall be acceptable:
i. Hubbell
ii. Leviton
2. 30-Ampere devices
a. Connectors shall be 30 ampere, 2 wire plus ground, locking, with nylon bodies and casings, and integral cable clamp. Configuration shall be NEMA L5-30
b. The following manufacturer’s devices shall be acceptable:
i. Hubbell
ii. Leviton
3. 20-Ampere 208V devices
a. Connectors shall be 20 ampere, 2 wire plus ground, locking, with nylon bodies and casings, and integral cable clamp. Configuration shall be NEMA L6-20.
b. The following manufacturer’s devices shall be acceptable:
i. Hubbell
ii. Leviton

B. Edison
   1. 20 Ampere device
      a. Connectors shall be 20 ampere 2 wire plus ground with nylon bodies and casings, and integral cable clamp. Configuration shall be U ground NEMA 5-20.
      b. Connectors shall be of commercial grade or better.
      c. The following manufacturer's devices shall be acceptable.
         i. Hubbell
         ii. Leviton

C. PowerCon devices
   1. A locking 3-conductor equipment AC connector with contacts for line, neutral and pre-mating ground contact.
   2. Power In devices shall be Blue
   3. Power-Out devices shall be Grey.
   4. The following manufacturer's devices shall be acceptable:
      a. Neutrik "powerCON"
      b. Approved Equals

D. 20-ampere 6-circuit multi-pin
   1. A threaded coupling 19-pin cylindrical connector for theatrical lighting applications
   2. All multi-conductor connectors shall be wired in accordance with the recommended practice RP-1 as published by the U. S. Institute for Theatre Technology.
   3. The following manufacturer's devices shall be acceptable:
      a. Veam
      b. Socapex
      c. LEX Products
   4. All products shall be compatible with Socapex 419 Series connectors.

E. Single pole locking connectors
   1. Connectors shall be 400 ampere, single wire, locking with Thermoplastic Elastomer casing, with nylon retaining screw. Body shall be brass with double set screw termination. Configuration shall be compliant with UL 1691.
   2. Connectors shall accept wire sizes from #6 Awg to 4/0 Awg.
   3. Acceptable Products:
      a. Hubbell Single Pole Devices
      b. Crouse-Hinds Cam-Lok
      c. Leviton Rhino-Hide

F. Quantities per Drawings & Schedules.

2.20 STAGE MANAGER'S PANEL

A. The Stage Manager's Panel shall be a rolling, portable type, dead-front, and completely wired internally.

B. The panel shall include a desk, shelf, lockable cabinet, worklight with dimmer, and a switched duplex convenience receptacle.

C. Face of panel shall include:
   1. EP-T lighting control touch screen
   2. "ALL ON" switch. Recessed rear-illuminated pushbutton switch. Color: Red. Operation Push On / Push Off. Pushbutton shall directly activate designated dimmers to full intensity. Switch shall be protected against accidental activation.
   3. Night Light switch. Recessed rear-illuminated pushbutton switch. Color: Green. Operation: Push On / Push Off. Night Light switch shall activate dedicated fixture circuits for use when the theatre is unoccupied. The Night Light preset shall only be activated and deactivated with this switch and with a similar switch in the Stage Manager Console. All other houselight controls and worklight switches, including

Entry Panels, will continue to operate while the Night Light preset is engaged, but their action shall not affect any channels being controlled by the Night Light preset.

4. Two (2) Flush-mounted LED digital clocks with stopwatch function. All setting and stopwatch controls shall be on front panel.
5. Dimmable LED 18" gooseneck rack lights. Quantity: two (2)
6. Network connection to Network Data System
7. Edge lighting control panel
8. Switched power strip for convenience power: one (1) 20A, 120VAC circuit.

D. Panel shall include two (2) 25' multi-conductor cable bundle terminating in locking connectors appropriate for mating with the Stage Manager Receptacle Panel. One bundle shall carry all control signals, and one cable bundle shall carry all 110V power circuits. Cables shall be bundled using spiral cable wrap for the center 80% of their length.

E. All labels and legends shall be engraved directly into the face plates and filled with white paint.

F. No devices utilizing cooling fans shall be located in the stage manager's panel.

2.21 EMERGENCY BYPASS DETECTION (EBDK)

A. The Enclosure shall be a surface mounted, constructed of 16-guage formed steel panels removable front cover finished in fine textured, scratch-resistant, powder coat paint.

B. Accessories for installation, including tap kits and manual reset switch kits shall be available from a single manufacturer.

C. Emergency Bypass Detection enclosures shall support 100 to 277-volt configurations. EBDK enclosures shall be field configurable for single-phase, bi-phase, and three-phase operation without the need for additional components.

D. The Emergency Bypass Detection Kit shall be completely pre-wired by the manufacturer. The contractor shall provide input feed and control wiring.

E. All control wire connections shall be terminated via factory provided connectors.

F. The Bypass Detection Kit shall be UL-924 Listed for interaction with similarly listed dimming and switching panels.

G. The EBDK shall be fully compatible with other equipment furnished under this Section.

H. Approved Products:
1. Emergency Bypass Detection Kit by ETC
2. Phase Loss Sense Panel by Vari-lite

I. Refer to E sheets for quantity and location.

J. Furnish to Division 26 contractor for installation.

2.22 DMX EMERGENCY BYPASS CONTROL

A. Where required to trigger special-purpose lighting presets and bypass normal lighting controls during emergency or panic situations, a DMX Emergency Bypass Controller (DEBC) shall be provided.

B. Functional
1. The DMX Emergency Bypass Controller shall be capable of overriding a single universe of ANSI E1.11–2008, USITT DMX512-A control signals from "Normal" to "Bypass" when a trigger signal is detected via a two-pin trigger input.
a. The DMX Emergency Bypass Controller shall poll the bypass trigger input after a power loss and react upon start up.

b. The default or recorded sequence shall be recalled immediately on restart if the trigger is also applied at restart

2. The DMX Emergency Bypass Controller shall be capable of recording a single DMX preset (snapshot) of 512 channels for recall during “Bypass” mode.
3. The DMX Emergency Bypass Controller shall output to up to six optically isolated DMX lines.
4. The DMX Emergency Bypass Controller shall be UL-924 Listed for interaction with similarly listed products.
5. The DEBC shall be fully compatible with the control system provided under this Section.

C. Approved Products:
1. DMX Emergency Bypass Controller by ETC
2. Emergency DMX Bypass Switch by Vari-Lite

D. Refer to E sheets for quantity and location.

E. Furnish to Division 26 contractor for installation.

2.23 WORK LIGHT FIXTURE

A. Uniform wide beam fixture with high temperature housing and lens. Integral electronic driver shall be auto ranging 120V-277V, 50/60 Hz, minimum 40,000-hour lamp life. Fixture shall be convection cooled. Housing to be black.

B. Dimmable LED, 3,000 degrees Kelvin, beam angle shall be 60° to 120°.
1. 200W, 18,000 lumens, 3000 degrees Kelvin
2. 150W, 13,500 lumens, 3000 degrees Kelvin
3. 80W, 11,600 lumens, 3000 degrees Kelvin

C. Install 3' power cord with L5-20 twist lock plug. Mount fixture with Leviton TA0CC-000 C-clamp or equal. Provide black safety cable.

D. Approved fixture:
1. Altman LED Work Light II, 90W, 3000K
2. Times Square WL80, 3000K
3. Approved equal

E. Quantity: Auditorium – 20 work light assemblies.

2.24 APRON EDGE LIGHTING SYSTEM

A. Low profile extrusion housing capable of supporting up to 200# point loads. Extrusion shall be no larger than ¾” wide by ½” deep.

B. Sources shall be low voltage LEDs.

C. 120v AC power supply with manual intensity control.

D. Two circuits on switch at stage manager’s panel:
1. One circuit on apron edge
2. One circuit on orchestra pit edge

E. Angled red LED lights shall be visible to stage performers but not visible to audience. Configure as shown on drawings. Centerline and quarter-mark LEDs blue.

F. Approved Product:
1. Edgelyte by Future Light
2. Acceptable substitution

2.25 COMPANY SWITCHES

A. Provide Theatrical System company switches as described herein and as shown on Electrical Drawings.

B. Company switch configuration shall be 120/208V, 60A to 400A, 3-phase, 5-wire, as noted on Electrical Drawings. Switches rated 200A or greater shall have double neutrals.

C. 200A and 400A switches
1. Provide 100% rated, 3-pole, Main Circuit Breaker with minimum AIC rating of 65,000A.
2. 3-phase, 120/208 VAC company switch assemblies shall be provided with connectors by Cam-Lok, Leviton or equal, compatible with industry standard Cam-Lok E1016 devices, six connectors, including neutrals.
3. All connections from Main Circuit Breaker to output panel shall be by copper bus.
4. All internal, non-current carrying metal parts shall be grounded to main cassis frame.
5. Enclosure
   a. Should meet or exceed all applicable NEC standards and shall be listed by a Nationally Recognized Testing Laboratory (NRTL).
   b. Shall be of no less than 14 gauge steel with 4 welded mounting tabs.
6. Provide a front door panel to protect circuit breaker controls. Circuit breaker shall be protected from accidental operation. Breaker shall be equipped with a padlock attachment to lock the handle in the off position when not in use.
7. Access door shall contain a shunt-trip mechanism that is engaged when door is not fully closed so that no connections can be made or broken under load. This access door shall include a keyed locking handle. Provide a continuous piano hinge with a stainless steel pin for access door.
8. Internal connections shall accept up to 500mcm wire.
9. Ground shall not be connected to frame.
10. Unit shall provide strain relief for securing cable in connection chamber. All temporary power connections shall be from below.
11. Indicator lights shall be provided for each supply phase and ground. Lights shall be color-coded and labeled with alphabetic name, per NEC standards.
12. Label according to application.
13. Maximum dimensions: 40” H x 24” W x 10” D
14. Manufacturers:
   a. ESL Power Systems Show Switch
   b. Lex Products Corp. CS-XXXF-C6DS1
   c. ETC PowerSafe
   d.

D. 60A and 100A switches:
1. 3-phase, 120/208VAC 4-pole, 5-wire company switch assemblies shall be provided with connectors compatible with industry standard pin and sleeve devices.
2. Enclosure
   a. Should meet or exceed all applicable NEC standards and shall be listed by a Nationally Recognized Testing Laboratory (NRTL).
3. Switch shall contain unfused pin and sleeve mechanical interlock receptacle with safety disconnect. Mechanical interlock shall prevent connection or disconnection from occurring in while disconnect is in “on” position.
4. Maximum dimensions TBD.
5. Label according to application.

6. Manufacturers:
   a. ESL Power Systems Pin & Sleeve Company Switch
   b. Hubbell
   c. Leviton
   d. Approved Equal

2.26 BRANCH CIRCUIT EMERGENCY TRANSFER SWITCH(BCELTS)

A. The BCELTS shall provide automatic transfer of a single branch 120V circuit from normal to emergency power source, when normal power fails.

B. The BCELTS shall transfer a lighting load branch circuit from a relay to a second power source in the event of a loss of power to the primary power source, a normal system failure, or activation of a fire alarm.

C. The system shall be listed under ANSI / UL1008 Transfer Switch Equipment and comply with ANSI / NFPA 110 Standard for Emergency and Standby Power Systems, and ANSI / NFPA 70 (NEC), including Article 700, 701 and 702 safety standards.

D. The switch shall be positively latched and unaffected by voltage variations or momentary outages so that constant contact pressure is maintained, and temperature rise at the contacts is minimized. The switch shall be electrically interlocked to ensure only one position, either Normal or Emergency, is engaged at any time. The switch shall be break-before-make to ensure that normal and emergency sources are never interconnected within the unit. Built-in fuses shall provide 10,000 Ampere Short Circuit Current Rating (SCCR) on the connected emergency circuit. Switch contacts shall withstand transfer without welding, with 180º phase displacement between normal and emergency power sources if both sources are energized. Transfer switch contacts shall be rated for mixed loads.

E. Furnish per E drawings

2.27 CONSOLE TABLE

A. Provide a table for the lighting console with the following features:
   1. Desktop to be 6’-0” long by 2’-6” wide, by 3/4” thick.
   2. Desktop to be from 100% recycled wood.
   3. Edges eased for reduction of pressure fatigue.
   4. Meets California Air Resources Board’s (CARB 2) emission standard.
   5. Corners rounded.
   6. Provide with 3” x 6” cable pass through.
   7. Provide with two button up/down controller.
      a. Controller shall provide minimum of 4 user programable presets and display the desktop elevation.
   8. Provide with Freeport power strip.
      a. Eight 15-amp receptacles
      b. Two USB charging ports
      c. On/Off power switch
   9. Desk top color: Slate grey
   10. Frame:
      a. Powered height adjustment
         i. Adjustable in height from 23.75” to 48.75”.
      b. Minimum load capacity 355 pounds evenly distributed.
      c. Provide frame with 3” swivel, locking castors.
      d. Frame to be dust and moisture resistant.
      e. Steel frame under the top with steel leg structure.
      f. Frame color to be Carbon Black.
   11. Warranty shall be for 5 years.

12. Approved Manufacturer:
    a. Uplift Desk
    b. Evodesk
    c. Acceptable substitution
13. Quantity:
    a. Theatre: 2

PART 3 - EXECUTION

3.1 GENERAL

A. Install all items of the stage lighting and dimming system where indicated and completely connect, wire, and make operative as specified.

B. Isolate cables carrying signals at different levels to restrict control interference. Separate wiring into conduits for low-level analog and digital and optical control, power circuits up to 50 amps each, and feeder services to dimmer banks. Exercise care in wiring to avoid damage to cables and equipment.

C. Make all digital control circuits, wiring, and connections with shielded cable and connectors. Terminate shields properly to prevent and guard against electromagnetic and electrostatic noise.

D. Equipment racks and portable equipment to be wired in a neat manner with care taken to provide for future serviceability and expansion. No loose or randomly routed wires shall be permitted.

E. Each outlet box shall be provided with connector shown on drawing or as specified. Each receptacle circuit number shall be clear coated after application to prevent removal. Orient the number in an upright position easily seen by operating personnel.

F. All lamicoid labels shall be permanently attached in a neat and plumb manner (i.e., glue **and** screws). Double-sided adhesive tape will not be accepted.

G. Letters on pushbutton switches shall be engraved and filled with contrasting paint (on translucent lenses).

H. Each stage circuit shall have one load and one neutral connector. All unused wire shall be terminated in an approved manner at a junction box terminal strip for future expansion.

I. All circuits, which are disconnected during the construction period, shall be reconnected to insure that all equipment is in proper working order at end of construction period.

J. Coordinate location of all devices installed over the stage and wings with Section 116133 work.

K. Protect all portable cables (Type SO cables) from kinks, abrasion and binding. Support both ends of portable cables with strain relief devices as specified herein. Make top connection of cable then allow the cable to hang free for a minimum of four days prior to bottom connection or rigging to prevent cable twisting.

L. Install work light fixtures at owner’s direction.

M. Install dimmer rack using resilient pads as specified herein. No portion of the dimmer rack shall contact any part of the building structure or walls except through resilient connections specifically approved by the Architect. All load, feed, and control conduit connections to the dimmer racks shall be isolated through the use of deflection fittings, Type DF as manufactured by Appleton Electric, or approved equal.

N. Assemble and move console tables to control booth.

O. Terminate control wire from architectural fixtures controlled by this Section in appropriate devices at the Signal Processing Rack.

P. Address and make fully operational all lighting network devices. Coordinate addressing of light fixtures controlled under this Section with Division 26.

Q. Program preset and master stations per direction of the Architect, Consultant, and Owner.

3.2 MANUFACTURER'S RESPONSIBILITY

A. An authorized representative of the manufacturer of the stage lighting and dimming system equipment shall be required to visit the project during construction and after completion to check installation of each system of stage and house lighting dimming equipment.

B. Systems will not be turned on or rendered active in any way until approved by representative of manufacturer who shall be present when systems are activated.

3.3 INSTRUCTION OF OWNER PERSONNEL

A. Contractor or manufacturer’s representative, fully knowledgeable and qualified in operation of the installed system, shall provide a total of eight (12) hours of instruction to Owner-designated personnel on the safe operation, servicing, care, and maintenance of these systems. Training times may not be continuous, however, manufacturer shall not be required to conduct more than two separate training sessions. Instruction times shall be arranged through the Owner.

B. Instruction shall be scheduled in conformance with test and instruction schedules, and availability of Owner, staff, Architect, Architect’s Consultant, and their representatives. While it may be possible to schedule the instruction session(s) to coincide with the final observation, such coincidence shall not be assumed.

C. The Architect and other representatives may be present or represented.

D. The same Contractor’s representative shall be present at the first formal use of the Stage Lighting and Dimming System to further instruct Owner personnel in operation.

E. Completion of staff instruction shall be verified, in writing, with the signature of an authorized Owner’s Representative within 5 business days of completion. Copies will be given to the Owner, the General Contractor, the Architect and the Consultant.

3.4 ACCEPTANCE BY OWNER

A. Contractor will request acceptance testing by the Architect’s Consultant when the system is substantially complete.

B. Acceptance testing will include operation of each major system and all other components deemed necessary. Contractor will the assist as necessary in this testing, and will provide test equipment and personnel as required.

C. In the event the need for further adjustment or work becomes evident during acceptance testing, the Contractor will continue his work until system is acceptable at no addition to the contract price. If approval is delayed because of defective equipment or failure of equipment or installation to meet the requirements of these specifications, the Contractor will pay for any additional time and expenses of the Architect’s Consultant during any extension of the acceptance testing period.

3.5 CLEANING OF THE SITE AND EQUIPMENT

A. Remove from the site all rubbish, trash, discarded packing materials, cartons, and other debris caused by daily operations. Upon completion of work, the entire area of work by this Contractor shall be left in broom clean condition.

B. Clean any racks, floor pockets, panels, and similar devices that may have accumulated dust and debris during work.

END OF SECTION 11 61 63

SECTION 11 66 23

GYMNASIUM EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Basketball equipment.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for installation of floor-insert sleeves to be cast in concrete slabs and footings.
2. Section 096466 "Wood Athletic Flooring" for game lines and markers.
3. Section 096566 "Resilient Athletic Flooring" for game lines and markers.
4. Section 096766 "Fluid-Applied Athletic Flooring" for game lines and markers.
5. Section 116653 "Gymnasium Dividers" for gymnasium divider curtain systems.

1.2 DEFINITIONS

A. BWF: Badminton World Federation.

B. FIBA: Federation Internationale de Basketball (The International Basketball Federation).

C. FIVB: Federation Internationale de Volleyball (The International Volleyball Federation).

D. NBA: National Basketball Association.

E. NCAA: The National Collegiate Athletic Association.

F. NFHS: National Federation of State High School Associations.

G. WNBA: Women's National Basketball Association.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site~~Insert location~~.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include assembly, disassembly, and storage instructions for removable equipment.
2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.

~~B. Sustainable Design Submittals:~~

1. ~~Product Data: For composite wood products, indicating that product contains no urea formaldehyde.~~
2. ~~Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.~~
3. ~~Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.~~
4. ~~Product Data: For composite wood products, indicating compliance with requirements for formaldehyde emissions.~~
5. ~~Product Data: For composite wood products, indicating that product contains no urea formaldehyde.~~

~~C.~~B. Shop Drawings: For gymnasium equipment.

1. Include plans, elevations, sections, and attachment details.
2. Include details of field assembly for removable equipment, connections, installation, mountings, floor inserts, and operational clearances.
3. Include transport and storage accessories for removable equipment.
4. Include diagrams for power, signal, and control wiring.

~~D.~~C. Samples: For each exposed product and for each item and color specified.

~~E.~~D. Samples for Initial Selection: For each type of gymnasium equipment.

~~F.~~E. Samples for Verification: For the following products:

1. ~~Basketball Net: Full size.~~
2. ~~[Volleyball][Badminton] Net: Minimum 12-inch length by full height, including one edge and net accessories.~~
3. ~~[Volleyball][Badminton] Floor Insert: Full-size unit.~~
4. ~~[Volleyball][Badminton] Post Standard: Full-size unit[with net tensioner].~~

~~5.~~1. Pad Fabric: Wall padding minimum 3 inches square, with specified treatments applied. Mark face of material.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Court layout plans, reflected ceiling plans, and other details, drawn to scale, and coordinated with ceiling-suspended gymnasium equipment, floor inserts, game lines, and markers applied to finished flooring, and coordinated with each other, using input from installers of the items involved:

1. Structural members to which overhead-supported gymnasium equipment will be attached.
2. Suspended ceiling components, if any.
3. Items supported from building structure above the courts, including the following:

   a. Luminaires.
   b. Air outlets and inlets.
   c. Speakers.
   d. Sprinklers.
   e. Smoke detectors.
   f. Acoustical treatments or panels.
   g. Access panels.
   ~~h. <Insert item>.~~

B. Setting Drawings: For embedded items and cutouts required in other work.

C. Qualification Data: For Installer.

D. Product Certificates: For each type of gymnasium equipment.

E. Field quality-control reports.

F. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For gymnasium equipment to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify position and elevation of floor inserts and layout for gymnasium equipment.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of gymnasium equipmentthat fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Basketball backboard failures, including glass breakage.
b. Faulty operation of basketball backstops.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Basketball backstops and anchors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7~~Insert requirement~~.

B. Revise articles below to suit Project. These include paragraphs that are examples of gymnasium equipment and are not intended to be all inclusive. Indicate individual equipment or assembled system dimensions and elevations on Drawings. Use these example paragraphs as guides for developing paragraphs for other types of gymnasium equipment.

2.2 BASKETBALL EQUIPMENT

A. Source Limitations: Obtain from single source from single manufacturer.

B. Standard Rules: Provide equipment according to the requirements of ~~FIBA's "Official Basketball Rules - Basketball Equipment."NBA's "Official Rules of the National Basketball Association."~~NCAA's "Men's Basketball Rules."~~NCAA's "Women's Basketball Rules."NFHS's "Basketball Rules Book."WNBA's "Official Rules of the Women's National Basketball Association."~~

C. Protruding fasteners or exposed bolt heads on front face of backboards are not permitted.

D. Connections: Manufacturer's standard connections or connections recommended in writing by manufacturer and complying with Section 055000 "Metal Fabrications" of size and type required to transfer loads to building structure.

E. Overhead-Supported Backstops:

~~1. Stationary Type: Manufacturer's standard assembly.~~
~~2.~~1. Folding Type: Manufacturer's standard assembly for ~~forward-folding, front-braced~~forward-folding, rear-braced~~backward-foldingside-folding~~ backstop, with hardware and fittings to permit folding.
~~3.~~2. Framing: Steel pipe, tubing, and shapes designed to minimize vibration during play.

a. Center-Mast Frame: ~~Welded~~Welded and bolted or clamped with side sway bracing.
b. Dual-Mast Frame: ~~Welded~~Welded and bolted or clamped with cross bracing.
c. Finish: Manufacturer's standard primer for field finishing~~polyester powder-coat finish~~.

~~4.~~3. Goal Height Adjuster: Adjustable from 8 to 10 feet to top of ring with gear-drive mechanism, locking in any position within adjustment range, with visible height scale attached to side of framing.

a. Operation:

1) Manual operation with detachable crank handle.
2) Electrical: Electric operation with integral gear-drive motor, with limit switches preset to goal heights and the following:

a) Key switch control.
b) One~~Insert number~~ detachable electric control device(s).
c) Wireless remote control.

~~F. Wall-Mounted Backstops: Complete assembly extending from wall, including support framing to building structure, bracing, cables, support chains, pulleys, fittings, hardware, pipe anchors, equipment pads, and fasteners.~~

~~1. Stationary Type: Manufacturer's standard assembly for stationary backstop.~~
~~2. Folding Type: Manufacturer's standard assembly for [upward][side]-folding backstop.~~
~~3. Framing: Steel pipe, tubing, and shapes designed to minimize vibration during play.~~

~~a. Finish: Manufacturer's standard [primer for field finishing][polyester powder-coat finish].~~

4. Extension: [6 inches][12 inches][18 inches][24 to 48 inches][48 to 120 inches][As indicated on Drawings]<Insert dimension(s)>.
5. Goal Height Adjuster: Adjustable from 8 to 10 feet to top of ring with gear-drive mechanism, locking in any position within adjustment range, with visible height scale attached to side of framing.

a. Operation:

1) Manual: Manual operation with detachable crank handle.
2) Electrical: Electric operation with integral gear-drive motor, with limit switches preset to goal heights, and [one]<Insert number> detachable electric control device(s).

G.F. Backstop Safety Device: Designed to limit free fall if support cable, chains, pulleys, fittings, winch, or related components fail; with mechanical automatic reset; 6000-lb load capacity; one per folding backstopwhere indicated.

1. Retractor Device: Manufacturer's standard device designed to retract both support and safety cables, chains, and straps away from play of the basketball when backstop is in playing position; one per folding backstopwhere indicated.

H.G. Winch: Hoist consisting of heavy-duty, fully enclosed worm-gear; brake; cable drum; cable; and fittings, for mounting on wall with equipment-mounting boardInsert requirement; designed to move and hold backboard in any raised or lowered position.

1. Operation: Manual winch with detachable hand crank.
2. Portable Winch Operator: [One]<Insert number> portable electric motor-drive device(s), including adaptor to fit crank mechanism.

I.H. Backstop Electric Operator: Provide operating machine of size and capacity recommended in writing by manufacturer for equipment specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, and remote controls. Coordinate wiring requirements and electrical characteristics with building electrical system.

1. Electrical Components, Devices, and Accessories: Listed and labeled according to NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Operator Type: Cable drum with grooved drum and cable tension device to automatically take up cable slack and retain cable in grooves.
3. Operator Mounting: On wall with equipment-mounting boardInsert requirement.
4. Motor Electrical Characteristics:

a. Horsepower: 1/23/41Insert number hp.
b. Voltage: 115 V ac, single phase, 60 hertz.

5. Remote-Control Station(s): NEMA ICS 6, Type 1 enclosure for surfacerecessed or flushInsert requirement mounting and momentary-contact, three-position, switch-operated control with up, down, and off functions.

a. Group Key Switch Control Stations: One switch per each backstoptwo backstopsInsert requirement.
b. Keys: Provide one keytwo keysone set of dual keystwo sets of dual keysdual keys, one key for up and one for down per station.
c. Switches, Ganged: Single faceplate with multiple switch cutouts for two switches operating four backstopsfor three switches operating six backstopsfor four switches operating eight backstopsfor five switches operating 10 backstopsfor six

switches operating 12 backstopsas indicated on Drawings.

d. Control Station Enclosure: Provide prime-painted metal enclosure with integrally formed padlock haspskey access, with two sets of keys per enclosure.

e. Radio Controls: One per backstop winch and [two]<Insert number> portable multiple-channel transmitters for operating [two][four][up to nine]<Insert number> backstops individually with up and down functions.

6. Limit Switches: Adjustable switches at each backstop, interlocked with motor controls and set to automatically stop backstop at fully retracted and fully lowered positions.

J.I. Basketball Backboards:

1. Shape and Size:

a. Rectangular, 72 by 42 inches72 by 48 inchesInsert dimensions width by height.

b. Fan-shaped, 54-inch maximum width by [35-inch][39-inch] maximum height.

2. Backboard Material: Provide with predrilled holes or preset inserts for mounting goals, and as follows:

a. Fiberglass: Minimum 1-1/2-inch- thick, composite backboard consisting of minimum two 3/16-inch- thick, molded-fiberglass panels laminated together over faces and edges encapsulating a 3/4-inch honeycomb core, reinforced at goal and backboard mountings, or a wood panel product core; with threaded inserts or embedded anchors for mounting backboard corners to support framing at standard mounting centers.

b. Glass: Minimum 1/2-inch- thick, transparent tempered glass according to ASTM C1048Kind FT (fully tempered) and with impact-testing requirements in 16 CFR 1201 Category II or ANSI Z97.1 Class A for safety glazing.[Provide glass and framing system manufactured according to FIBA Level 1 or Level 2 requirement that glass does not split off if broken.]

1) Frame: Provide glass with impact-absorbing resilient rubber or PVC gasket around perimeter in a fully welded, [painted steel][brushed-natural-finish, extruded-aluminum] frame, with steel subframe, reinforcement, bracing, and mounting slots for mounting backboard frame to backstop.

2) Standard Mount: Provide steel corner reinforcement with mounting slots for mounting backboard frame to backstop at standard mounting centers.[Provide center-strut frame reinforcement.]

3) Direct Mount: Designed for mounting backboard frame to center mast of backstop, to maximize stress relief on backboard frame and glass.

4) Rim-Restraining Device: According to NCAA and NFHS rules and designed to ensure that basket remains attached if glass backboard breaks.

c. Steel: Single-piece, steel face sheet, minimum [0.1046-inch]<Insert dimension> nominal thickness, with 1-1/2-inch- deep, roll-edged perimeter flange and with steel-reinforced, welded frame welded to back side of backboard; with mounting slots for mounting backboard frame to backstop at standard mounting centers.

d. Hardwood or Particleboard: Minimum 1-1/2-inch- thick backboard consisting of minimum 1/32-inch- thick, phenolic-resin-impregnated cellulose and paper laminate over front and back sides of 1-1/2-inch hardwood or particleboard core; with painted edges and corners and with threaded inserts or slotted brackets for mounting backboard corners to backstop at standard mounting centers.

3. Target Area and Border Markings for Clear Tempered Glass: Permanently etched in

white color, marked in ~~pattern and stripe width according to referenced standard rules~~manufacturer's standard pattern and stripe width.

4. Target Area and Border Markings for Opaque Surfaces: Marked in ~~pattern, stripe width, and color according to referenced standard rules~~orange, with manufacturer's standard pattern and stripe width~~black, with manufacturer's standard pattern and stripe width~~.
5. Finish: Manufacturer's standard factory-applied, white background.

~~K.~~J. Goal-Mounting Assembly: Compatible with goal, backboard, and backstop; with ~~5-inch o.c. horizontally and vertically5-inch o.c. horizontally and 4-inch o.c. vertically5-inch o.c. horizontally and 4-1/2 inch o.c. vertically~~manufacturer's standard~~Insert dimensions~~ hole pattern for goal attachment.

1. Glass Backboard Goal-Mounting Assembly: Goal support framing and reinforcement designed to transmit load from goal to backstop and to minimize stresses on glass backboard.
2. Direct Mount: Designed for mounting goal directly and independently to center mast of backstop, so that no force is transmitted by ring directly to backboard, and rigidity and stability of goal are maximized.

~~L.~~K. Basketball Goals: Basket ring complete with flanges, braces, attachment plate, and evenly spaced loops welded around underside of ring.

1. Single-Rim Basket Ring Competition Goal: Materials, dimensions, and fabrication ~~complying with referenced standard rules~~per manufacturer's standard design.
2. Type:

   a. Movable: Pressure-release design with manufacturer's standard breakaway mechanism and rebound characteristics identical to those of fixed, nonmovable ring.

3. Pressure-Release Characteristics: Positive-lock movable breakaway design, with manufacturer's standard mechanism, including preset pressure release, set to release between 181- and 231-lb~~at more than 100-lbInsert value(s)~~ load, and automatic reset. Provide movable ring with rebound characteristics identical to those of fixed, nonmovable ring.
4. Field Adjustment: Provide ring that is field adjustable for rebound elasticity without being removed from the backboard.
5. Mount: ~~Front~~Rear.
6. Net Attachment: No-tie loops for attaching net to ring without tying~~Tube tie for attaching net to ring~~.
7. Finish: Manufacturer's standard~~Polyester powder-coat~~ finish.

~~M.~~L. Basketball Nets: 12-loop-mesh net, between 15 and 18 inches long, sized to fit ring diameter, and as follows:

1. Cord: Made from white ~~cotton~~nylon.
2. Competition Cord: Antiwhip, made from white nylon cord, minimum 120-gm thread and maximum 144-gm thread.

~~N.~~M. Backboard Safety Pads: Designed for backboard thickness and extending continuously along bottom and up sides of backboard and over backstop ~~as required by referenced standard rulesaccording to manufacturer's standard designand~~as indicated on Drawings.

1. Attachment: ~~Peel-and-stick tapeAdhesiveBolt on~~Manufacturer's standard.
2. Color: ~~BlackGrayManufacturer's standard color~~As selected by Architect from

manufacturer's full range.

2.3 MATERIALS

A. Support Cable: ~~1/4-inch- diameter, 7x19~~Manufacturer's standard galvanized-stranded-steel wire rope with a breaking strength of 7000 lb. Provide fittings according to the wire rope manufacturer's written instructions for size, number, and installation method.

~~B. Support Chain and Fittings: For chains used for overhead lifting, provide Grade 80 heat-treated alloy-steel chains, according to ASTM A391/A391M, with commercial-quality, hot-dip galvanizedorzinc-plated steel connectors and hangars.~~

~~C. General-Purpose Chain: For chains not used for overhead lifting, provide carbon steel chain, according to ASTM A413/A413M (Grade 30 proof coil chain or higher grade recommended by gymnasium equipment manufacturer). Provide coating type, chain size, number, and installation method according to manufacturer's written instructions.~~

~~D. Castings and Hangers: Malleable iron, according to ASTM A47/A47M; grade as required for structural loading.~~

~~E. Composite Wood Products: Products shall be made without urea formaldehyde.~~

~~F. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."~~

~~G. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.~~

~~H. Composite Wood Products: Formaldehyde emission rates shall not be greater than the following when tested according to ASTM D 6007 or ASTM E 1333:~~

1. Hardwood Plywood: 0.05 ppm.

~~I. Composite Wood Products: Products shall be made without urea formaldehyde.~~

~~J. Softwood Plywood: DOC PS 1, exterior.~~

~~K. Particleboard: ANSI A208.1.~~

~~L. Equipment-Mounting Board: Wood, [transparent][or][neutral-color-painted] finish; size and quantity as required to mount gymnasium equipment according to manufacturer's written instructions.~~

~~M.~~B. Anchors, Fasteners, Fittings, and Hardware: Gymnasium equipment manufacturer's standard corrosion-resistant or noncorrodible units; concealed.

~~N.~~C.

~~O. Grout: Nonshrink, nonmetallic, premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout, according to ASTM C1107/C1107M, with minimum strength recommended in writing by gymnasium-equipment manufacturer.~~

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for court layout, alignment of mounting substrates, installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance of the Work.

1. Verify critical dimensions.
2. Examine supporting structure, subfloors, and footings below finished floor.
3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements are clearly marked. Locate reinforcements and mark locations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's written installation instructions ~~and competition rules for each type of gymnasium equipment~~.

B. Install gymnasium equipment after other finishing operations, including painting, have been completed unless otherwise indicated.

C. Permanently Placed Gymnasium Equipment and Components: Install rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated; in proper relationship to adjacent construction; and aligned with court layout.

1. Floor-Insert Locations: Coordinate locations with application of game lines and markers, and core drill floor for inserts after game lines are applied.
2. Floor-Insert Elevation: Coordinate installed heights of floor inserts with installation and field finishing of finish flooring and floor-plate type.
3. Operating Gymnasium Equipment: Verify clearances for movable components of gymnasium equipment throughout entire range of operation and for access to operating components.

D. Floor-Insert Setting: Clean oversized, recessed voids in concrete substrate of debris. Position each sleeve, and fill void around sleeve with grout, mixed and placed according to grout manufacturer's written instructions. Protect portion of sleeve above subfloor[and footing] from splatter. Verify that sleeves are set plumb, aligned, and at correct height and spacing; hold in position during placement and finishing operations until grout is sufficiently cured. Set insert so top surface of completed unit is flush with finished flooring surface.

E. Anchoring to In-Place Construction: Use anchors and fasteners where necessary to secure built-in and permanently placed gymnasium equipment to structural support and to properly transfer load to in-place construction.

F. Connections: Connect electric operators to building electrical system.

G. Removable Gymnasium-Equipment Components: Assemble in place to verify that equipment and components are complete and in proper working order. Disassemble removable

gymnasium equipment after assembled configuration is approved by Architect~~Owner~~, and store units in location indicated on Drawings.

~~3.3 INSTALLATION OF SAFETY PADS~~

~~A. Mount with bottom edge at [4 inches][dimension indicated on Drawings]<Insert dimension> above finished floor.~~

~~B. Cutout Trim: Limit cuts in face of padding so that cuts are securely and fully concealed behind trim-kit flange.~~

~~3.4~~3.3 FIELD QUALITY CONTROL

A. Testing Agency: ~~Owner will engage~~Engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Perform visual inspections and operational tests as recommended by referenced standard rules of each sport and the equipment manufacturer.
2. Test rebound elasticity of basketball goals.
3. Test basketball goal pressure-release characteristics and adjustability.

C. Gymnasium equipment will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

~~3.5~~3.4 ADJUSTING

A. Adjust movable components of gymnasium equipment to operate safely, smoothly, easily, and quietly; free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range; and lubricate as recommended in writing by manufacturer.

~~**3.6 DEMONSTRATION**~~

~~**A. [Engage a factory-authorized service representative to train][Train] Owner's maintenance personnel to adjust, operate, and maintain gymnasium equipment.**~~

END OF SECTION 11 66 23

SECTION 12 35 53
LABORATORY CASEWORK

Vanguard Maple – Full Overlay
Construction Specification

1.00 MANUFACTURERS

A. The basis of this specification is wood casework manufactured and constructed according to the standards used by Leonard Peterson & Co., Inc., 400 Webster Road, Auburn, Alabama. The specified design is **Vanguard – FULL OVERLAY.** All laboratory equipment covered by the specification shall be the product of one manufacturer and be fabricated at one geographic location to assure shipping continuity and single-source responsibility. All quotations from a manufacturer other than Leonard Peterson & Co., Inc. shall contain a review of the following capabilities:

1. List of shop facilities
2. List of engineering and manufacturing personnel
3. Proof of financial ability to fulfill the contract
4. List of a minimum of ten (10) installations over the last five (5) years of comparable scope
5. Proof of project management and installation capabilities
6. AWI Premium Grade Certification Number.

B. The selected manufacturer must warrant for a period of three (3) years, starting on the date of acceptance or occupancy, whichever comes first, that all products sold under the contract referenced above shall be free from defects in material and workmanship. Purchaser shall notify the manufacturer's representative immediately of any defective product. The manufacturer shall have a reasonable opportunity to inspect the goods. The purchaser shall return no product until receipt by purchaser of written shipping instructions from the manufacturer.

C. Samples:
Samples from non-specified manufacturers will be required and reviewed per specification. Samples shall be delivered, at no cost to the architect or owner to a destination set forth by the architect or owner. This must be done seven (7) days before quotation deadline as a condition of approval of each bidder. Samples shall be full size, production type samples. Miniature, or "Show Room" type samples are not acceptable. Furnish the following:

1. One combination drawer and cupboard base unit showing complete construction details, including one shelf.
2. One leg corner sample showing table construction.
3. One sample of all top materials shown or called for, of sufficient size to perform finish requirements test.
4. Sample of mechanical service fittings, locks, door pulls, hinges, and interior hardware and other material deemed necessary for review.

D. The above samples of the successful manufacturer may be impounded by the architect or owner to insure that material delivered to the jobsite conforms in every respect to the samples submitted.

2.00 MATERIALS

A. General:

1. Casework shall be full overlay and constructed in accordance with the best woodworking practices. All cabinetry shall be produced in manufacturers own facility and operated under his control and supervision. First class quality of casework shall be established and maintained by use of proper machinery, finishing products, tools, fixtures and skilled workmanship.

2. Casework units to be dowel pin construction with all joints properly glued making each unit rigid and self-supporting.

3. Material shall be selected so that the finished installation shall provide an attractive and harmonious appearance. All exterior casework surfaces exposed to view after installation shall be maple. Solid woods and veneers behind closed doors or drawers shall be of color and graining in conformance with the normally accepted standard required of the scientific laboratory equipment industry.

B. Solid Woods:

All solid woods shall be hardwood carefully and thoroughly air-dried, then kiln dried in humidity controlled kilns to a moisture content of 4-1/2%. All kiln dried lumber shall then be tempered to a moisture content of 6% before use. This moisture content shall be maintained throughout production.

C. Plywoods:

All plywood shall be hardwood. Soft woods such as Fir or Pine are not permitted.

1. Veneer Core Plywood:

Veneer core plywood shall be either 7-ply (3/4”) or 9-ply (1”) and shall be compliant with ANSI/HPVA HP-1 2009.

2. Composition Core Plywood:

Composition core plywood shall be 3-ply and shall be compliant with ANSI A208.1-2009, and/or ANSI A208.2-2009.

3. Face Veneers:

Plywood face veneers shall be Grade A, plain sliced, book matched, maple on face, and Grade 1, maple on back.

D. Banding:

Plywood panels to shall be edge banded as specified with a multiple ply hardwood edge-banding or 1/8” (3mm) solid lumber to match exposed cabinet veneer.

E. Tempered Hardboard:

Tempered Hardboard shall be a wood fiber/resinous combination formed with heat and pressure into sheets providing a hard, smooth surface and shall be compliant with ANSI A135.4-2004.

F. Dowels:

Assembly dowels, used to joint rails to panels, shall be fluted hardwood 8mm in diameter x 36mm in length. All dowels glued into components.

G. Glass:

Glass for framed sliding and swinging doors shall be 1/8" float glass (tempered glass provided when specified). Glass for unframed sliding doors shall be ¼" float glass.

H. Glues:

All glues used in the manufacture of plywood, assembly of component parts and cabinetry to be water resistant with no added urea formaldehyde.

I. Finishes:

Conversion varnish with no added urea formaldehyde and shall comply with HUD 24 CFR 3280.308.

J. Hardware:

1. Drawer and door pulls: Bar Type made of extruded aluminum 4-1/2" long and ½" wide having dull brushed finish. Pull attached with two (2) No. 10 flat head machine screws countersunk on 4"centers. Pulls provided for all hinged doors and drawers. (Plastic pulls or a design not compatible for use by the handicapped is not acceptable.)

2. Hinges: Butt style, 5-knuckle, institutional type of dull finished stainless steel, 2-1/2" by 3-1/8", unequal winged, tight pinned and with wing thickness of .081". Each hinge is secured by seven plated No. 7 flat head screws. (Surface mounted hinges shall not be acceptable.)

   Doors hung with paired hinges are capable of supporting 175 pounds at 12" from pivot point of hinges with no distortion of hinges or degradation of casework. Hinged doors up to 48" high furnished with 1 pair of hinges. Hinged doors over 48" high furnished with 1-1/2 pair of hinges.

3. Drawer Slides: 100 lb. rated capacity, full extension, zinc plated, linear ball bearing made of cold rolled steel. Drawers removable without the use of tools.

4. Shelf support clips: double pin type made of vinyl having anti-tipping seismic feature. Each clip capable of supporting 200 pounds. Clips engage into holes drilled into cabinet end panels or partitions.

5. Catches: spring loaded, nylon roller type, designed for quiet operation provided for hinged doors. Cabinets with locked paired doors have elbow catches inside left-hand doors. Cabinet and case doors provided with 2 catches, one at top and one at bottom, where elbow catches are not furnished.

6. Leg shoes: molded black vinyl 2-1/2" high. Legs attached to floor provided with shoes, and furnished with semi-concealed plated metal angle clips for securement.

7. Drawer and hinged door locks (except tall case doors): dead bolt style, heavy-duty, five-tumbler, of non-ferrous metal and master-keyed having 3/8" bolt throw and single bitted style keyway. Barrel and back plate of locks are riveted

together; lock bolts are non-removal. Locks with cams held in place with machine screws or nuts are not acceptable. Locks are secured to rear of drawer and door fronts with flat head screws. Each lock furnished with one non-ferrous key when keyed alike and two non-ferrous keys when keyed differently. Locks furnished as indicated on details or as is standard with catalog descriptions unless otherwise specified. Latching handles shall be provided with locks where required. Locks shall be keyed to same master key as locks provided for other drawer and hinged door cabinets.

8. Glides: black nylon, minimum 1-3/4" diameter and adjustable on 3/8" diameter x 1-1/2" plated stem. Glides provide on table legs not attached to floors.

9. Support rods, ¾" diameter aluminum with the upper ends rounded and the lower ends tapered to fit support rod plates. Support rod plates made of aluminum secured into table top with heavy brass nut. Cross bars made of ¾" diameter aluminum with rounded ends, and provide with clamps for attachment to support rods.

2.01 CONSTRUCTION

A. General:

The prime intent of this specification is to define the essential minimum cabinet case and table requirements of the materials, and construction, finish and workmanship to be supplied. Cabinetry to be of convention reveal overlay style design having drawer and doors provided with edges overlapping openings on all edges. Each cabinet unit shall be completely factory assembled and finished. Cabinets constructed with flush interiors having no offsets maximizing drawer and cupboard space and ease of cleanability. All exposed joints shall be closely fitted and tight showing no open joints when finished. All exposed corners eased. Individual cabinet, case and table units shall meet or exceed the Recommended Standards and Practices outlined in SEFA 8.

B. Base Cabinets:

1. End panels, partitions, bottoms and shelves:

Exposed end panels, partitions, bottoms and shelves to be ¾" thick maple veneer core plywood. Unexposed end panels, partitions, bottoms and shelves to be ¾" thick birch or maple veneer core plywood providing light cabinet interiors behind closed doors. Exposed edges of end panels, partitions and bottoms to be banded in maple. Edges of shelves behind solid doors to be maple wood or maple PVC depending on finish.

Interiors of end panels and partitions to be drilled to receive dowel inserted edges of rails, bottoms and toe boards and bored for shelf clips where required. Bottoms machined for and provided with dowels (on maximum of 96mm centers) for insertion into end panels or partitions and grooved to receive cupboard backs.

Cupboard base cabinet shelves to be ¾" thick veneer core plywood, adjustable on 1-1/4" (32mm) centers.

2. Top Frame:

Cabinet top frame to be comprised of a front rail and a back rail. Front rail to be 4" x 1" hardwood having exposed edge maple banded and end edges drilled and provided with three (3) dowels for horizontal glued insertion into cabinet end

panels at front. Back rail shall be ¾" hardwood varying in height from 9" high for 35" high cabinets to 7-3/4" high for 29" high cabinets and inserted vertically at rear into cabinet end panels. End edges of back rails each drilled and provided with four (4) dowels for glued insertion into ends panels.

3. Intermediate Rails:

Intermediate Rails to be 4" x ¾" hardwood having exposed edge maple banded and end edges each drilled and provided with 3 dowels for insertion into end panels. Intermediate rails placed horizontally at face of panels between all drawers or drawers and cupboards. Intermediate rails machined to receive engagement of lock bolts and security panels when specified.

4. Backs:

Interior cupboard backs to be ¼" thick tempered hardboard and provided removable. Backs set into grooved cabinet bottom and attached at top to rear vertical rail with minimum of two (2) screws. Exposed interior cupboard backs to be ¼" veneer core maple plywood provided removable unless specified as fixed.

Exposed exterior finished maple backs for free standing cabinets or mobile units to be of ¾" thick maple veneer core plywood with exposed edges banded. Free standing units up to 8'0" long shall be provided with one piece back and shipped assembled to cabinets.

5. Drawers:

Drawer heads shall be ¾" thick, maple composite core plywood. Drawer sides, back and sub-front to be 15/32" thick, 11 ply birch plywood. Drawer fronts secured to four-sided drawer body with the use of screws. Drawer bodies secured with interlocking lap joints and back fully rabbeted into sides. Joints glued and pinned. Bottoms to be ¼" tempered hardboard fully grooved into drawer sub-fronts, sides and back.

Drawers provided with 100 lb. full extension slides and pulls as described under Hardware. Drawers over 26" wide to have two (2) pulls.

6. Security Panels:

Security panels shall be ¼" thick tempered hardboard attached to back of front intermediate rails and fastened into security clips or rails at rear of cabinet. Security panels provided only when locks are keyed differently between drawers or drawers and cupboards.

7. Hinged Paneled Doors:

Doors shall be ¾" thick, maple, composite core plywood edge banded on all four edges. Paired cabinet doors to have matched grain pattern. Doors provided with two (2) hinges, one (1) pull and one (1) catch as described under Hardware.

8. Toe Spaces:

Base Cabinets to have recessed toe space 4" high x 2-1/2" deep. Toe board made of ¾" thick water resistant hardwood. End edges machined for and provided with three (3) dowels for glued insertion into cabinet end panels. Toe boards further secured to underside of bottom with glue block(s) for rigidity.

C. Wall Cases, Counter Mounted Cases, and Tall Storage Cases:

1. End Panels, Partitions, Bottoms and Shelves:

Exposed end panels, partitions, bottoms and shelves to be maple veneer core plywood. Unexposed components to be birch or maple veneer core plywood providing light cabinet interiors behind closed doors. Exposed edges of end panels, partitions and bottoms to be banded in maple. Edges of shelves behind solid doors to be maple wood or maple PVC depending on finish. End panels machined to receive doweled bottoms, tops and toe boards. Dowels to be spaced on maximum 96mm centers. End panels bored to receive adjustable shelf clips on 1-1/4" (36 mm) centers.

End panels, partitions and bottoms of tall cases to be ¾" thick.

Tops, of wall cases, counter mounted cases and tall cases to be 1" thick. Bottoms of wall cases and counter mounted cases to be 1" thick. All exposed front edges to be hardwood edge banded.

Wall and counter mounted cases to be provided with ¾" thick veneer core plywood shelves. Shelves for tall case to be 1" thick veneer core plywood. Exposed front edge of shelves to be maple banded. All shelves to be full depth and adjustable except for center shelf provided in tall cases which shall be fixed.

2. Backs:

Unexposed interior backs shall be ¼" tempered hardboard grooved into tops, ends and bottoms. Exposed interior backs shall be ¼" veneer core maple plywood attached to tops, ends and bottoms. Backs are further supplied and secured with ¾" x 3" wide batton strips behind back of backs for reinforcement and through which hardware shall be attached for securement to walls. Exposed exterior back shall be ¾" thick veneer core maple plywood having maple edge bands.

3. Toe Boards:

4" high toe boards provided at base of tall storage cases shall be ¾" thick water resistant hardwood. End edges to each machined for and provided with 3 dowels for insertion into case ends. Toe boards set flush with face of ends and further secured to underside of bottom with glue block(s) for rigidity.

4. Hinged Panel Doors:

Doors shall be ¾" thick, maple, composite core plywood edge banded on all four edges. Door provided with similar hardware to base cabinets except doors over 36" high to have 1-1/2 pair of hinges and 2 catches.

Tall case doors to be provided with latching handles securing doors to cabinet walls or behind left hand doors and to case tops and bottoms.

5. Hinged Glassed Doors:

Doors shall be ¾" thick, maple, composite core plywood edge banded on all four edges. Door shall be made of 3" wide solid maple (plywood not acceptable) rails having mitered mortis and tenon corner glued and reinforced with pins.

Doors provide with hardware same as described for panel doors.

Glass shall be set with wood molding.

6. Sliding Panel and Sliding Glazed Doors:

   Similar in construction to hinged door descriptions. Each door face machined to receive recessed plated steel fingertip pull. Door top and bottom edges machined for hardware to allow doors to operate on non-ferrous metal tracks. Doors up to 30" high shall be furnished with and operate on self-lubricating plastic slides. Doors over 30" high shall be furnished with and operate on ball bearing sheaves.

D. Apron and Table Frame Construction:

1. Apron and table frames made of hardwood. Exposed rails minimum ¾" thick x 4-3/4" high maple grooved for acceptance of cross rails and corner blocks.

2. Reinforcing cross rails made of hardwood, grooved, glued and screwed into front and back rails.

3. Apron and table rail corner blocks, for attachment of legs shall be 13 gauge formed plated steel grooved and screwed into aprons.

4. Legs, solid maple, minimum 2-1/4" square and furnished with 4-1/2" long uniquely designed bolt which passes through leg having exposed head conforming to leg edge rounding and treaded end furnished with washer and nut for secure attachment behind corner block. Depending upon table requirements, legs are provided with leg shoes or adjustable glides, as described under Hardware.

5. Leg stretchers, where required, to be not less than 1" x 2-3/4" mortised and tenoned into legs and secured with bolts. Cross stretchers shall be of similar construction, tenoned into stretchers and secured with bolts.

6. Book compartment bottoms furnished in 22 gauge black powder coated formed steel, tempered hardboard, birch or maple plywood depending on style of unit in which compartment occurs.

7. Panel legs, for attachment of aprons, to be 1-1/4" thick constructed of hardwood plywood having top and bottom concealed solid hardwood bands. Exposed edges faced with solid maple bands.

E. Cabinet Finish:

1. After assembly of cabinets but prior to the application of wood stain and sealing cabinet and case parts to be sanded smooth and loose fibers and dust removed.

2. Exposed cabinet and case parts and backs of doors then receive an application of stain. Excess stain to be removed by wiping with wood wool and/or cloth, and parts allowed to thoroughly dry. Unexposed interiors behind solid doors and drawers left natural providing light interiors for ease of viewing.

3. After drying, exposed parts, cabinet and case interiors, shelves, drawers and doors to receive a double coat of clear resinous wood sealer. Exposed cabinet

parts, drawers, doors, and cupboard and case interiors then receive a double coat of clear, chemical resistant synthetic varnish. Between all applications of sealer and varnish, cabinet parts to be lightly sanded and wiped. The resulting exterior finish shall be semi-gloss and provide an acid, alkali, solvent, water and abrasive-resistant surface.

4. Applied finish to meet Finish Test Requirements of SEFA 8.

2.02 COUNTERTOPS:

1. General:

A. Countertops constructed per specification covering particular type.
B. Tops having sinks provided with drip grooves cut into underside of exposed edges.
C. Adhesives or fasteners to be provided for securing of tops to cabinet work. Such materials to allow for contraction or expansion of tops where necessary.
D. Tops shall be 1” thick unless otherwise specified and provided with 4” high curbs where tops abut walls, columns, case ends, etc.

2. Types:

A. **Phenolic Resin** is fabricated from composite panels comprised of multiple layers of selected papers impregnated with special phenolic resins, manufactured under heat and pressure to form a solid black chemical resistant composite throughout the entire thickness of the panel. Tops shall be furnished black in color having black exposed edges honed smooth and exposed corners and edges chamfered back approximately 1/8”. Tops shall have a non-glaring surface.

B. **Epoxy Resin** is fabricated from a molded modified epoxy resin that has been especially compounded and cured to provide optimum physical and chemical resistance. Tops have a uniform mixture throughout, and do not depend on a surface coating that can be readily removed by chemical or physical abuse. Tops are non-glaring and black in color. All exposed edges shall be chamfered back approximately 1/8". All curbs and backsplashes to be 4” high-applied.

2.03 SINKS:

1. Epoxy resin sinks are cast of black modified epoxy resin having high resistance to chemicals, heat and shock as normally encountered in laboratories. Castings are done in permanent molds producing sinks with all inside corners coved and bottoms dished. Sinks to be drop-in style.
Epoxy resin sinks provided with 1-1/2” epoxy resin outlets.
Tail pieces, traps and drain lines to be furnished by Others unless otherwise noted on details or in equipment schedule.

2. Sinks shall be installed by Casework Contractor.
Outlets to be installed by Others.

2.04 PLUMBING FIXTURES:

1. Plumbing fixtures furnished in laboratory grade chrome plated brass as manufactured by Water Saver Faucet Company.
Fixtures provided with brass tank nipples complete with locknuts and washers for attachment to countertops.
Water fixtures provided with inline vacuum breakers unless otherwise indicated.
Fixtures supplied assembled (tank nipples loose).

2. Safety shower and eyewash units shall be furnished in make and model numbers listed on the drawings or outlined in equipment schedule as manufactured by Water Saver Faucet Co.

3. Pedestal electric boxes, cast aluminum finished in black textured coating furnished with tank nipples and locknuts for attachment to countertops.
Electrical boxes mounted in table or cabinet aprons shall be steel.
Electric receptacles, switches, etc., shall be specification grade 20 amp and UL approved. Receptacles located within 6'0" of sinks to be G.F.I. type.
Cover plates for receptacles shall be stainless steel.
Mounting of electric boxes in table aprons or cabinet units to be by Casework Manufacturer.

3.00 EXECUTION

1. For approval by owner or architect, within 30 days after receipt of order submit shop details showing floor plans, rough-ins and elevations of casework and equipment being supplied. Floor plans with rough-in details to be in 3/16" scale. Elevation drawings to be in 3/8" scale.

2. Prior to fabrication of casework field check project site to assure proper fit of materials being provided. Adjust drawings as necessary to insure proper fit of all casework and equipment to building conditions.

3. Deliver casework only after wet operations are complete and building is closed in, dry and has proper climate control for installation of casework.
(Area in which laboratory casework is installed to be maintained between 65 and 75 degrees F. with relative humidity maintained between 45% - 55%.)
If these conditions are not met and maintained, product warranty is void.

4. Install casework in accordance to manufacturers recommended practice by qualified casework installer having a minimum of 3 years' experience in the installation of institutional casework.

5. Adjust casework and hardware so that doors and drawers operate smoothly. Lubricate operating hardware as recommended by manufacturer.

6. Advise owner or contractor on procedures and precautions to be taken to protect casework and other materials installed from damage by work performed by other trades.

7. During installation keep job site clean and remove debris on a daily basis. Floors are to be broom cleaned upon completion.

END OF SECTION

SECTION 12 36 00
SOLID SURFACE MATERIALS

PART 1 - GENERAL

1.01 SUMMARY:

A. Extent of solid surface material is shown on the drawings, including solid surface work surfaces.
B. Coordination of Fabrication: Wherever possible, check dimensions of supporting structure at the site by accurate field measurements before final submittal of shop drawings and fabrication of tops. However, coordinate fabrication schedule with construction progress as directed by the Contractor to avoid delay of the work. Where necessary, proceed without field measurements and coordinate installation tolerances to ensure proper fit.

1.02 QUALITY ASSURANCE:

A. All solid surface material work shall be from the same production run to assure uniformity in color and appearance.
B. Shop Assembly: Preassemble items in the shop to the greatest extent possible. Disassemble units only to the extent necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
C. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible, to ensure proper fitting of the work. However, do not delay job progress; allow for trimming and fitting wherever the taking of field measurements before fabrication might delay the work.

1.03 SUBMITTALS:

A. Manufacturer's Data: Submit manufacturer's detailed materials and installation specifications and other data for solid surface material.
B. Samples: Submit three (3) samples not less than 4" x 4" in size of color, grade and finish of solid surface material required. Sample to include one joint showing method of jointing and finishing.
C. Shop Drawings: Indicate dimensions, component sizes, fabrication details, attachment provisions and coordination requirements with adjacent work.
D. Maintenance Data: Include recommended cleaning materials and procedures and damage repair.

1.04 DELIVERY, STORAGE AND HANDLING:

A. Protect tops from damage during loading, shipment delivery and storage. Use non-staining materials for blocking and packing. Stack units at the site in accordance with fabricator's recommendations.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Solid Surface Material: Provide the following products:
    2. Corrian
        a. approved equal.
        b. Thickness: As indicated.
        c. Finish And Color: Refer to the “Finish Legend”.
B. Sealants And Joint Adhesives: Provide types as recommended by the manufacturer of solid surface material. Colors shall match solid surface material. Joint adhesive shall

create inconspicuous, non-porous joints and shall not contain urea formaldehyde. Elastomeric sealant joints and caulking shall not exceed 250 g/L.

2.02 FABRICATION:

A. General: Fabricate as shown. Cut accurately to shape and dimensions indicated. Provide holes cut or drilled for anchors, fasteners, brackets as shown and as necessary to secure tops in place.
B. Fabricate components in shop to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and solid polymer manufacturer requirements.
C. No evidence of drilling, cutting or patching shall be exposed in the finished work. Allow for expansion and contraction.
D. Form joints between components, including joints between tops and backsplashes and manufacturer's field installed integral lavatory bowls and sinks using manufacturer's joint adhesive; without conspicuous joints.
E. Finish on all exposed surfaces shall be a uniform finish as scheduled.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Install in accordance with fabricator's approved shop drawings.
B. Finished work shall be level, plumb and in correct relationship to adjacent work.
C. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.
D. Thermal Movement: Form field joints between panels to accommodate movement between panels, as set forth by the manufacturer.
D. Backsplashes and sidesplashes shall be adhered to tops using manufacturer's standard color-matched silicone sealant.
E. Sealant and Caulking: Caulk all joints between solid surface material and adjoining construction after installation. All uses of sealants and caulking are to be in accordance with manufacturer's instructions.
F. Keep components clean during installation. Remove adhesives, sealants and other stains. Replace stained components.
G. Protect surfaces from damage. Repair work or replace damaged work that cannot be repaired to Architect's satisfaction.

END OF SECTION

SECTION 12 61 00
FIXED AUDITORIUM SEATING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Section, apply to work of this section.

B. Refer to Contract Drawings “TS” series for plans, graphic representations, schedules, and notations showing Fixed Auditorium Seating work. Also, refer to “E” Series drawings for related work.

C. Division 3 - Concrete

1.2 GENERAL CONDITIONS

A. For the sake of brevity these specifications omit phrases such as "(Sub)Contractor shall furnish and install,” "unless otherwise indicated or specified,” etc., but these phrases are nevertheless implied. Mention of materials and operations requires the (Sub)Contractor to furnish and install such materials and perform such operations complete to the satisfaction of the Architect/Engineer. Exceptions are noted herein or shown on the drawings.

B. No representative of the Owner shall have power to waive the obligations of this contract for the furnishing of good materials or of performing good work, as herein described, in full accordance with the contract documents. The failure of any representative of the Owner to condemn any defective work or materials shall not release the obligation to at once tear out, remove, and properly replace the same at any time prior to final acceptance upon discovery of said defective work or material. When requested, however, the Owner's representative shall observe and accept or reject any material furnished. In the event the material has been accepted once by the Owner's representative, such acceptance shall be binding on the Owner unless it can be clearly shown that such material does not meet the specifications for this work.

1.3 SCOPE

A. The work under this contract shall include the furnishing of all labor, materials, tools, equipment, transportation, services, etc., and supervision necessary to complete the demolition of the existing audience seating and installation of new seating, as indicated. Extent of all work shall be furnished as described in these specifications, as illustrated on the accompanying drawings, or as directed by the Architect/Consultant.

B. Provide and install fixed auditorium chairs with upholstered seats and backs, and aisle and center standards, all as specified, floor mounted, with self-lifting seats that raise automatically to a uniform 3/4 fold position.

C. Varying lateral sizes of backs shall be used in accordance with approved seating shop drawings, with standards in each row spaced laterally so that the end standards shall be in alignment from first to last row whether aisles are of constant of converging width. Use a variety of chair width from 20” wide to 24” wide with the majority of the chair widths to be 22”. Chairs less than 20” wide are not acceptable.

D. All equipment specified herein, or shown on related drawings, including all hardware, fittings and components necessary for full and complete installation, including:

1. Samples and preparation and submission of complete, detailed shop drawings and diagrams for review prior to fabrication.
2. Verification of dimensions and conditions at job site. Field dimensions are required.

3. Transportation to job site, unloading and initial setup.
4. Coordination with associated trades and installation in accordance with these specifications, pertinent drawings, established trade criteria and applicable code requirements.
5. Services required for inspection, demonstration and necessary adjustment of completed installations.
6. Training of Owner's staff personnel, half-day session, minimum.
7. Submission of required record drawings, service and operational data and certificates.

1.4 AMERICANS WITH DISABILITIES ACT

A. Comply with ADA Rules and Regulations.

1.5 FIRE PERFORMANCE CHARACTERISTICS OF UPHOLSTERED SEATING

A. Chairs provided shall have been tested and certified as complying with BIFMA ANSI Standard for Office and Institutional furnishings – Public and Lounge Seating BIFMA X5.4-2020 sponsored by the Business and Institutional Furniture Manufacturer's Association.

B. Fabric shall be Class 1 according to Department of Commerce CS 191 and 16 CFR 1610.61 tested according to California Technical Bulletin 117.

C. Padding shall comply with California Technical Bulletin 117.

1.6 QUALITY ASSURANCE

A. All equipment and installation to be the responsibility of a single Manufacturer.

B. Provide all new materials of types specified.

C. A qualified and experienced supervisor of the Manufacturer shall be at the site during the installation and shall actively direct and supervise the work.

D. Turn over all work to the owner in undamaged condition.

E. For purposes of establishing the quality and performance desired, the following companies are approved as manufacturers for the herein specified equipment:

1. Irwin Seating Company
2. Series Seating
3. Ducharme Seating

F. Approval indicates approval of the manufacturer only and not approval of specific products. The Contractor shall be required to provide equipment, which will meet or exceed the intent of these specifications. To assure high and satisfactory quality, design, color and operation of products, reference has been made to brand names; however, it is not intended to limit competition and items of brands that are equal will be given full consideration.

1. Basis of Design: Ducharme Seating – Classic

G. Manufacturer shall have provided and installed five (5) seating projects of similar size and shall have been in service for 5 years or longer. Projects submitted as evidence of experience shall incorporate chairs with seats, backs and standards consistent with those offered on this project.

1.7 SUBMITTALS

A. Submit with or prior to bid a sample chair with features and components similar to those specified. Sample chairs from the successful bidders shall be retained by Owner until fabrication and installation is substantially complete and shall be used as a quality sample in reviewing final installation for acceptance. Sample chairs from unsuccessful bidders shall be retained by Owner for 30 days after bids are submitted. Manufacturer shall arrange for delivery and pick-up.

B. Within 45 days of Notice of Award, submit complete and at one time the following for review prior to fabrication:

1. Schedule for drawing preparation, fabrication, and installation, conforming to time limits set for this project.
2. A complete bill of materials with manufacturer's names, model and type numbers and catalog data sheets with clear notation where products vary from this specification.
3. The following samples:
   a. Manufacturer’s standard fabric cards
   b. Manufacturer’s standard plastic samples
   c. Powder coat color and finish samples
   d. Wood armrest materials and finish samples
   e. Number and letter plates
   f. Exposed fasteners, if any
   g. End standard aisle light
4. Other items as may be required in Division 1 or as requested. Such items and/or samples shall be provided within ten (10) days of written request.

C. Submit the following for review prior to fabrication and installation:

1. A complete two-chair sample mounted on a moveable base.
   a. Including working aisle light.
2. Complete, fully dimensioned shop drawings for layout and all components with indication by arrow and boxed caption of all variations from contract drawings and specifications.
   a. Layout drawings shall be based on field dimensions.
3. Samples shall become quality and finish standards for all similar items provided to the project.

D. Review of Submissions

1. Review of shop drawings and samples is for quality and design.
2. Such review does not change requirements of contract drawings or specifications, or reduce quality or quantity of items to be supplied, unless so stated in writing.
3. Such review does not relieve Manufacturer of responsibilities re site conditions as specified unless so stated in writing.

E. Maintenance instructions and inspection guidelines furnished for each chair model specified.

1.8 WARRANTIES AND GUARANTEES

A. Manufacturer shall guarantee parts replacement and system repair and site visits by factory representative, including time and travel expenses, for a period of two (2) years from the date of substantial completion. All guarantee work shall be coordinated with Using Agency's requirements for facility use. All guarantee work shall be performed within thirty (30) days of notification.

B. Warranty Periods:

1. Structural Components: 10 years.

2. Operating Mechanisms: 10 years.
3. Plastic, Wood and Painted Components: five years.
4. Upholstery Fabric: one year.
5. Electrical Components: one year.

C. Ordinary wear and defects due to improper usage are excepted.

D. Three signed copies of the above are required as a condition for final approval of the work.

1.9 SITE CONDITIONS

A. Manufacturer shall coordinate preparation of chair layout drawings and chair installation with the contractors for electrical service to aisle lights.

B. Manufacturer shall coordinate and installation of sating with HVAC contractor to ensure that vents are located in a manner that will not interfere with seating installation.

C. Manufacturer shall immediately notify in writing the Architect/Engineer of any conditions, measurements, quantities, or other data, as required for proper execution, fit and completion of all work, and for safe and proper operating clearances.

D. Manufacturer shall immediately notify the Architect/Engineer of any site conditions or variations that affect installation or completion of work, and where appropriate, shall indicate suggested remedial procedures by drawings and/or descriptions.

E. Contractor shall take care not to damage any equipment, which will be reused, or to disconnect any wiring other than as required to interface new system.

1.10 PERMITS

A. Obtain all permits necessary for the execution of any work pertaining to the demolition, and conform in all trades with all applicable local codes.

1.11 APPROVAL

A. The following conditions must be met before acceptance.

1. Approval of final tests and inspections.
2. Submittal of three signed copies of the warranty.
3. Submittal of record drawings, and data.
4. Instruction for staff.

PART 2 - PRODUCTS

2.1 STEEL

A. Steel shall be the primary structural material for chair support systems, including aisle and center standards, and back component attachment. Steel structural components shall be die-formed according to modern manufacturing methods, and assembled by means of state-of-the-art MIG welding processes. All steel shall have smooth surfaces and be of sufficient gauge thickness and designed to withstand strains of normal use and abuse.

B. Steel shall meet requirements for ASTM A 36/A 36M plates, shapes, and bars; ASTM A 513 mechanical tubing; ASTM A 1008/A 1008M cold-rolled sheet; and ASTM A 1011 hot-rolled sheet and strip.

C. All exposed metal parts shall be powder coated with a hybrid thermosetting powder coat finish. The powder coat finish shall be applied by electrostatic means to a thickness of 2 - 5 mils and shall provide a durable coating having a 2H Pencil hardness. Prior to powder coating, metal parts shall be treated with a three-stage non-acidic, bonderizing process for superior finish adhesion, and after coating shall be oven baked to cause proper flow of the epoxy powder to result in a smooth, durable finish. Manufacturer's standard color range shall be used

2.2 WOOD

A. Plywood, exposed or concealed, shall be hardwood. All plywood shall be hot press laminated using high frequency process. Interior plies shall be Class 3 or better. Exposed exterior plys shall be Class 1, continuous, and selected as to color. Solid hardwood shall be clear and shall be selected as to color. All exposed hardwood, solid or veneer, shall be northern-grown maple. Particle core shall be 55 pound density.

B. Medium-density fiberboard shall meet requirements for ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.

C. Concealed plywood shall meet requirements for HPVA HP-1 hardwood plywood.

2.3 PADDING MATERIAL

A. Seat and back padding material shall be of new (prime manufacture) polyurethane foam. Padding material shall comply with the flammability requirements outlined in the California Technical Information Bulletin #117, Resilient Cellular Materials, Section A & D, dated February 1975, when tested in accordance with Federal Test Method Standard 191, Method 5903.2.

2.4 FABRIC

A. Fabric shall exhibit superior color fastness, light fastness, tear strength, and break strength and shall be exceptionally resistant to staining, chemicals, and abrasion. Fabric shall meet Class 1 flammability requirements of the U.S. Department of Commerce Commercial Standard 191-53 per Bulletin #117 (California Code). Fabrics shall be available in a choice of 30 colors ranging from delicate to vibrant.

B. Fabric shall meet class 4.5 specifications for color fastness and light fastness and withstand 175,000 double rubs per ASTM D-4157. Fabric shall meet flammability resistance outlined in California Technical Bulletin 117, section E; CS-191-53, class 1; NFPA 260-2019, Class 1; UFAC, class 1; B.S. 5852 part 1: 1979 Ignition Source 0, smoldering cigarette.

2.5 FINISH

A. Metal Parts: All exposed metal parts shall be powder coated with a hybrid thermosetting powder coat finish. The powder coat finish shall be applied by electrostatic means to a thickness of 2 - 2.5 mils, and shall provide a durable coating having a 2H Pencil hardness. Prior to powder coating, metal parts shall be treated with a five-stage bonderization process for superior finish adhesion, and after coating shall be oven baked to cause proper flow of the epoxy powder to result in a smooth, durable finish. Manufacturer's standard color range shall be used.

B. Wood Parts: All exposed surfaces shall be stained to color selected and coated with lacquer of sufficient film depth to afford wear resistance of institutional quality and oven baked.

C. Plastic Parts: Color of plastic shall be selected from manufacturer's standard color range.

D. Hardware: All assembly hardware shall be rust resistant, black plated.

2.6 UPHOLSTERED BACKS:

A. The back components shall be upholstered and padded on their face with an injection molded plastic rear and shall be approximately 29" long to provide a height of back extending to a nominal 36" above the floor, the height necessary to allow proper shoulder support for the chair occupant. The back shall be compound-contoured to conform to the proper posture of a seated individual, giving special attention to supporting the lumbar region of the back.

B. The upholstery panels shall be 7/16" 5-ply hardwood plywood formed with compound curves for proper body support and shall be padded with a 2" thick polyurethane foam pad, and covered over its full face with the specified fabric. The polyfoam pad shall be securely cemented to the plywood inner panel, and the upholstery fabric shall be secured to the padding and upholstery panel by two tufted decorative tie-backs, and the fabric fastened to the hardwood inner panel by means of upholstery staples. The wings for the attachment of the complete back to the standards shall be not less than 14 gauge (.0747") steel, firmly bolted to the back using concealed threaded washers. Back wings shall have provision for three pitches, providing a selection of mean back angle of 18, 22, or 26 degrees.

C. The rear of the back shall be enclosed by an injection molded, high impact resistant, textured, linear polyethylene plastic panel, formed to enclose the edges of the inner upholstery panel at the top and both sides of the back; and shall be not less than 29" in length, extending below the seat level to protect the seat cushion from the rear. There shall be no exposed fasteners above the armrests. The molded plastic rear panel shall be contoured to conform to the shape of the inner plywood panel and shall, by its contours, set the tone of the entire chair design, suggesting comfort by its appearance.

2.7 UPHOLSTERED SELF-LIFTING SEAT

A. Seats shall be upholstered on their face with serpentine spring cushions supported by a structural, injection molded polypropylene foundation. Seats shall quietly and automatically self-lifting to a 3/4 fold position when unoccupied. Seats shall be ISO 9001 certified through routine testing during manufacturing to pass seat cycle oscillation, ASTM Designation F851-87 Test Method for Self-Rising Seat Mechanism, and 600 lb. static load to front of seat.

B. The seat cushion shall have a base structure of five serpentine springs spanning a structural, injection molded, glass-filled polypropylene frame. Serpentine arch springs spanning the frame shall be isolated from the polyurethane foam cushion by a tough, durable, non-woven, non-vegetable chafing barrier integrally molded with the cushion. The seat cushion shall have an extended front, high resilient polyurethane foam pad, molded to the contour of the springs on the bottom and providing a flat surface on the top of the cushion with a crisp, waterfall leading edge. Height of the cushion at the front edge shall be consistent at approximately 3-1/2" above the foundation. The specified fabric, carefully tailored, shall be of panel-side construction, secured around the perimeter of the cushion frame by means of a drawstring and staples. The seat cushion assembly shall be securely locked to the seat foundation, preventing unauthorized removal; but facilitating convenient removal by trained maintenance personnel.

C. Seat foundation shall be 25% glass-filled, injection molded polypropylene, strengthened by deep internal ribs and gussets, completely enclosing the self-lifting hinge mechanism, and providing an attractive, decorative bottom surface for the seat. Bolted attachment of the seat component to the chair structure shall be concealed by a color-coordinated plastic cap to present a finished, refined appearance. Bottom decorative surface shall be textured matching other plastic components in color.

D. When unoccupied, the seat shall quietly and automatically rise to a 3/4 fold position, and upon a slight rearward pressure, shall achieve full-fold, allowing the patron additional passing room. The seat shall rotate on two, molded, structural, glass-filled nylon hinge rods in internally molded channels with integral down-stops for exceptional strength. Seat-lift shall be accomplished by compression springs and lubricated plastic cams, providing quiet gentle seat uplift. Down-stops and up-stops shall be non-metallic, eliminating plangent noise and providing quiet operation.

2.8 STANDARDS

A. Aisle Standards: shall provide a rectangular support structure shall be formed of 16 gauge (.0598”) steel with the sides formed into "C" channels. The top of the column shall be provided with two formed steel dovetail lugs for secure attachment of the armrest. Brackets for seat attachment shall be 7 gauge (.1875") buttressed steel welded on the inside of the standard. Standards shall be machined to the appropriate floor incline to maintain proper seat and back height and angle. Heavy 12 gauge (.1046) attaching feet shall be securely welded to the standard to provide for attachment to the floor. The steel foot shall allow for severe tightening and shock without fracture.

B. A 14-gauge (.0747) steel formed foot shall be welded to the bottom of the rectangular column. This weldment shall be at all critical stress areas 360 degrees around the column and concealed on the inside so as not to detract from the clean appearance. The foot dimension shall be 8" x 2-3/4" to provide maximum bearing surface to the floor to withstand severe tightening and shock without fracture. The standard shall be fabricated to be compatible with the floor incline, and to maintain proper seat and back height and angle. All weldments shall be gas shielded, arc weld.

2.9 ARMRESTS

A. Armrests shall be solid hardwood with all edges well rounded. Armrests shall be furnished with two (2) keyhole slots in the bottom and shall lock securely to dovetail lugs provided on aisle and center standards. Further, one (1) security screw shall be utilized.

2.10 HANDICAPPED ACCESS AISLE STANDARDS

A. Aisle standards shall be arranged for easy access by handicapped individuals and shall be designed to allow the individual to transfer easily from a wheelchair to the theatre chair. The aisle standard support column shall be inclined to the rear at the top by 16 degrees and shall be equipped with an armrest capable of lifting to a position parallel with the chair back, opening sideways access to the seat. Aisle standards so equipped shall be provided with a label, displaying an easily recognizable "handicapped" symbol. Decorative requirements of aisle standards are waived for the Handicapped Access Standards.

B. Aisle standard that lifts up or swings out shall be capable of having working aisle lights.

C. Aisle standards shall be designated on the seating layout drawings.

2.11 AISLE LIGHTS

A. Aisle lights shall be furnished for the aisle standards located as designated on the approved seating plan. Aisle lights shall be low voltage, non-hazardous 24 volt, A.C. system, utilizing a minimum of six LEDs per standard, and providing adequate illumination for floor and/or steps adjacent to aisle standards. The light assembly shall be recessed under the aisle standard armrest, concealed from sight and protected from damage. The standard shall be completely pre-wired with 18" of wiring extending beyond the standard. The standard shall be provided with a flex-steel conduit connector thru which the wiring extension shall pass. Seating supplier shall furnish as part of the aisle light package a voltage reduction device, suitably housed in a steel safety enclosure and shall be equipped with primary and secondary fuses, terminal blocks, and safety disconnect; all components shall be listed by a Nationally Recognized Testing Laboratory (NRTL), and assembled by licensed electricians to N.E.C. specifications, to facilitate safe connection to the building electrical system. All wiring connections from the electric distribution system to the aisle light standards, and installation and connection of the voltage reduction device shall be the responsibility of the electrical contractor.

2.12 NUMBER AND LETTER PLATES

A. Numbering system shall be provided for identification of all chairs. Number and letter plates shall be furnished as shown on the approved seating layout. Number Plates shall be 5/8" x 1-5/8" with a bronze finish and black Helvetica Medium letters and numerals. The seat pans shall be recessed at the center of the front edge for the number plates, and the plates shall be attached by two (2) pop rivets. Bronze Letter plates shall be attached in a recess in the aisle standard armrest by two (2) escutcheon pins. Attaching hardware shall have a bronze finish compatible to plates.

2.13 SPARE PARTS

A. Furnish extra materials from the same production run that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Furnish complete seat and back assemblies equal to 5% of amount installed for each type and size of chair seat and back.

C. Furnish seat and back fabric covers equal to 5% of amount installed for each type and size of cushion.

D. Furnish armrests equal to 5% of amount installed for each type of armrest.

2.14 FABRICATION:

A. Manufacture fabric-covered cushions with molded padding beneath fabric and with fabric covering free of welts, creases, stretch lines, and wrinkles. For each upholstered component, install pile and pattern run in a consistent direction.

B. Fabricate floor attachment plates to conform to floor slope, if any, so that standards are plumb and chairs are maintained at same angular relationship to vertical throughout project.

C. Fabricate riser attachment plates to conform to riser heights so that standards are plumb and chairs are maintained at same angular relationship to vertical throughout project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for construction tolerances, material properties as they affect anchors and fasteners.

B. Examine locations of electrical connections.

C. Examine locations of HVAC supply ducts.

D. Do not proceed until unsatisfactory conditions have been corrected.

3.2 DELIVERY AND STORAGE

A. The fixed audience seating contractor will be held responsible for the unloading, storage and placement/installation of all items comprising the contract. The contractor shall be responsible for receiving and storing fixed audience seating offsite prior to installation. If storage is required off site, the owner will require a certificate of insurance showing their products additionally insured at the contractor's expense.

3.3 INSTALLATION

A. Coordinate installation of chairs with other trades,

B. Follow manufacturer's printed instructions for installation.

C. Standards shall be anchored with not less than two anchoring devices per standard, in color to match standard.

D. Install chairs using manufacturer’s recommended hardware and fasteners. Chairs in curved rows shall be installed at smooth radius.

E. Verify moving components operate smoothly and quietly.

3.4 ADJUSTING

A. Adjust chair backs so they are properly aligned with each other.

B. Adjust self-rising seat mechanisms to ensure seats in each row are aligned when in upright position.

C. Repair minor abrasions and imperfections in finishes with materials that match the factory-applied finish in color and sheen and are compatible for field application.

D. Replace upholstery fabric damaged during installation.

3.5 PROTECTION

A. Protect seating against damage during remainder of construction period, complying with manufacturer's direction.

B. Provide additional protection as needed to ensure that seating will not be damaged or deteriorated at time of Substantial Completion.

3.6 CLEANING OF THE SITE

A. Remove from the site all rubbish, trash, discarded packing materials, cartons, and other debris caused by daily operations. Upon completion of work, the entire area of work by this Contractor shall be left in broom clean condition.

3.7 TESTS AND INSPECTIONS

A. Tests and inspections during progress of the work, and for final approval, shall include visual examination, uncovering and disassembly of components and/or such other tests, inspections and operations as the Architect/Engineer or local authorities having jurisdiction may find necessary.

B. Upon completion of all work, the Manufacturer shall certify in writing that work is complete and ready for inspection for substantial completion. Inspection shall be scheduled by the Architect/Engineer at their convenience.

C. Should deficiencies due to faulty equipment or installation require re-inspection after final inspection, all expenses of such re-inspection, including time and travel of the Architect/Engineer shall be the responsibility of the Manufacturer without cost to the Owner.

3.8 STAFF INSTRUCTION

A. The Manufacturer's supervisor shall instruct designated representatives of the Owner in the care and maintenance of all items.

B. The Architect/Engineer and other representatives may be present or represented.

C. Instruction shall be scheduled in conformance with test and instruction schedules, and availability of the Architect/Engineer and their representatives.

D. Confirmation of completed instruction must be obtained in writing from appropriate Owner’s Representative, with copies provided to the Architect and Theatre Consultant.

END OF SECTION 12 61 00

SECTION 12 62 00

PORTABLE AUDIENCE SEATING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Section, apply to work of this section.

B. Refer to Contract Drawings “TS” series and “A” for plans, graphic representations, schedules, and notations showing Fixed Auditorium Seating work. Also, refer to “E” Series drawings for related work.

1.2 GENERAL CONDITIONS

A. For the sake of brevity these specifications omit phrases such as "(Sub)Contractor shall furnish and install,” "unless otherwise indicated or specified,” etc., but these phrases are nevertheless implied. Mention of materials and operations requires the (Sub)Contractor to furnish and install such materials and perform such operations complete to the satisfaction of the Architect/Engineer. Exceptions are noted herein or shown on the drawings.

B. No representative of the Owner shall have power to waive the obligations of this contract for the furnishing of good materials or of performing good work, as herein described, in full accordance with the contract documents. The failure of any representative of the Owner to condemn any defective work or materials shall not release the obligation to at once tear out, remove, and properly replace the same at any time prior to final acceptance upon discovery of said defective work or material. When requested, however, the Owner's representative shall observe and accept or reject any material furnished. In the event the material has been accepted once by the Owner's representative, such acceptance shall be binding on the Owner unless it can be clearly shown that such material does not meet the specifications for this work.

1.3 SCOPE

A. The work under this contract shall include the furnishing of all labor, materials, tools, equipment, transportation, services, etc., and supervision necessary for installation of new seating, as indicated. Extent of all work shall be furnished as described in these specifications, as illustrated on the accompanying drawings, or as directed by the Architect/Consultant.

B. Provide and install portable auditorium chairs with upholstered seats and backs, all as specified, floor mounted.

C. All equipment specified herein, or shown on related drawings, including all hardware, fittings and components necessary for full and complete installation, including:
   1. Samples and preparation and submission of complete, detailed shop drawings and diagrams for review prior to fabrication.
   2. Transportation to job site, unloading and initial setup.
   3. Coordination with associated trades and installation in accordance with these specifications, pertinent drawings, established trade criteria and applicable code requirements.

4. Services required for inspection, demonstration and necessary adjustment of completed installations.
5. Submission of required record drawings, service and operational data and certificates.

1.4 AMERICANS WITH DISABILITIES ACT

A. Comply with ADA Rules and Regulations.

1.5 FIRE PERFORMANCE CHARACTERISTICS OF UPHOLSTERED SEATING

A. Chairs provided shall have been tested and certified as complying with BIFMA Voluntary Upholstered Furniture Flammability Standard BIFMA X5.7-1991 sponsored by the Business and Institutional Furniture Manufacturer's Association.

1.6 QUALITY ASSURANCE

A. All equipment and installation to be the responsibility of a single Manufacturer.

B. Provide all new materials of types specified.

C. A qualified and experienced supervisor of the Manufacturer shall be at the site during the installation and shall actively direct and supervise the work.

D. Turn over all work to the owner in undamaged condition.

E. For purposes of establishing the quality and performance desired, the following companies are approved as manufacturers for the herein specified equipment:
   1. Ducharme

F. Approval indicates approval of the manufacturer only and not approval of specific products. The Contractor shall be required to provide equipment, which will meet or exceed the intent of these specifications. To assure high and satisfactory quality, design, color and operation of products, reference has been made to brand names; however, it is not intended to limit competition and items of brands that are equal will be given full consideration. This specification is based on Wenger Portable Audience Chair.

G. Manufacturer shall have provided and installed five (5) seating projects of similar size and shall have been in service for 5 years or longer. Projects submitted as evidence of experience shall incorporate chairs with seats, backs and standards consistent with those offered on this project.

1.7 SUBMITTALS

A. Submit with or prior to bid a sample chair with features and components similar to those specified. Sample chairs from the successful bidders shall be retained by Owner until fabrication and installation is substantially complete and shall be used as a quality sample in reviewing final installation for acceptance. Sample chairs from unsuccessful bidders shall be retained by Owner for 30 days after bids are submitted. Manufacturer shall arrange for delivery and pick-up.

B. Within 45 days of Notice of Award, submit complete and at one time the following for review prior to fabrication:
   1. Schedule for drawing preparation, fabrication and installation, conforming to time limits set for this project.

2. A complete bill of materials with manufacturer's names, model and type numbers and catalog data sheets with clear notation where products vary from this specification.
3. The following samples:
4. Manufacturer’s standard fabric cards
5. Manufacturer’s standard plastic samples
6. Powder coat color and finish samples
7. Wood armrest materials and finish samples
8. Number and letter plates
9. Exposed fasteners, if any
10. End standard aisle light (if any)
11. Other items as may be required in Division 1 or as requested. Such items and/or samples shall be provided within ten (10) days of written request.

C. Submit the following for review prior to fabrication and installation:
1. A complete one-chair sample.

D. Complete, fully-dimensioned shop drawings for layout and all components with indication by arrow and boxed caption of all variations from contract drawings and specifications. Layout drawings shall be based on field dimensions.
1. Samples shall become quality and finish standards for all similar items provided to the project.

E. Review of Submissions
1. Review of shop drawings and samples is for quality and design.
2. Such review does not change requirements of contract drawings or specifications, or reduce quality or quantity of items to be supplied, unless so stated in writing.
3. Such review does not relieve Manufacturer of responsibilities re site conditions as specified unless so stated in writing.

1.8 WARRANTIES AND GUARANTEES

A. Manufacturer shall guarantee parts replacement and system repair and site visits by factory representative, including time and travel expenses, for a period of two (2) years from the date of substantial completion. All guarantee work shall be coordinated with Using Agency's requirements for facility use. All guarantee work shall be performed within thirty (30) days of notification.

B. Ordinary wear and defects due to improper usage are excepted.

C. Three signed copies of the above are required as a condition for final approval of the work.

1.9 SITE CONDITIONS

A. Manufacturer shall coordinate preparation of chair layout

B. Manufacturer shall immediately notify in writing the Architect/Engineer of any conditions, measurements, quantities, or other data, as required for proper execution, fit and completion of all work, and for safe and proper operating clearances.

C. Manufacturer shall immediately notify the Architect/Engineer of any site conditions or variations that affect installation or completion of work, and where appropriate, shall indicate suggested remedial procedures by drawings and/or descriptions.

D. Contractor shall take care not to damage any equipment, which will be reused, or to disconnect any wiring other than as required to interface new system.

1.10 PERMITS

A. Obtain all permits necessary for the execution of any work, and conform in all trades with all applicable local codes.

1.11 APPROVAL

A. The following conditions must be met before acceptance.
1. Approval of final tests and inspections.
2. Submittal of three signed copies of the warranty.
3. Submittal of record drawings, and data.
4. Instruction for staff.

PART 2 - PRODUCTS

2.1 WOOD

A. Plywood, exposed or concealed, shall be hardwood. All plywood shall be hot press laminated using high frequency process. Interior plies shall be Class 3 or better. Exposed exterior plys shall be Class 1, continuous, and selected as to color. Solid hardwood shall be clear and shall be selected as to color. All exposed hardwood, solid or veneer, shall be northern-grown maple. Particle core shall be 55 pound density.

2.2 PADDING MATERIAL

A. Seat and back padding material shall be of new (prime manufacture) polyurethane foam. Padding material shall comply with the flammability requirements outlined in the California Technical Information Bulletin #117, Resilient Cellular Materials, Section A & D, dated February 1975, when tested in accordance with Federal Test Method Standard 191, Method 5903.2.

2.3 FABRIC

A. Fabric shall exhibit superior color fastness, light fastness, tear strength, and break strength and shall be exceptionally resistant to staining, chemicals, and abrasion. Fabric shall meet Class 1 flammability requirements of the U.S. Department of Commerce Commercial Standard 191-53 per Bulletin #117 (California Code). Fabrics shall be available in a choice of 30 colors ranging from delicate to vibrant.

B. Architecture to be select fabric

2.4 FINISH

A. Wood Parts: All exposed surfaces shall be stained to color selected and coated with lacquer of sufficient film depth to afford wear resistance of institutional quality and oven baked.

B. Architecture to select finish

2.5 NUMBER AND LETTER PLATES

A. A numbering system shall be provided for identification of all chairs. Number and letter plates shall be furnished as shown on the approved seating layout. Number Plates shall

be 5/8" x 1-5/8" with a bronze finish and black Helvetica Medium letters and numerals. The seat pans shall be recessed at the center of the front edge for the number plates, and the plates shall be attached by two (2) pop rivets. Bronze Letter plates shall be attached in a recess in the aisle standard armrest by two (2) escutcheon pins. Attaching hardware shall have a bronze finish compatible to plates.

1. Row Letter and chair number plates shall be magnetic or able to be removed and reattached repeatedly so that row letters and chair numbers can be changed as required from event to event.

2.6 DUCHARME LIVIA

A. Fully upholstered, customize it to match with any fixed seat for any type of venue.

B. Wood backing, arms and frame

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for construction tolerances, material properties as they affect anchors and fasteners.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 DELIVERY AND STORAGE

A. The portable audience seating contractor will be held responsible for the unloading, storage and placement/installation of all items comprising the contract. The contractor shall be responsible for receiving and storing portable audience seating offsite prior to installation. If storage is required off site, the owner will require a certificate of insurance showing their products additionally insured at the contractor's expense.

3.3 INSTALLATION

A. Coordinate installation of chairs with other trades,

B. Follow manufacturer's printed instructions for installation.

3.4 ADJUSTING

A. Adjust self-rising seat mechanisms to ensure seats in each row are aligned when in upright position.

B. Repair minor abrasions and imperfections in finishes with materials that match the factory-applied finish in color and sheen and are compatible for field application.

C. Replace upholstery fabric damaged during installation.

3.5 PROTECTION

A. Protect seating against damage during remainder of construction period, complying with manufacturer's direction.

B. Provide additional protection as needed to ensure that seating will not be damaged or deteriorated at time of Substantial Completion.

3.6 CLEANING OF THE SITE

A. Remove from the site all rubbish, trash, discarded packing materials, cartons, and other debris caused by daily operations. Upon completion of work, the entire area of work by this Contractor shall be left in broom clean condition.

3.7 TESTS AND INSPECTIONS

A. Tests and inspections during progress of the work, and for final approval, shall include visual examination, uncovering and disassembly of components and/or such other tests, inspections and operations as the Architect/Engineer or local authorities having jurisdiction may find necessary.

B. Upon completion of all work, the Manufacturer shall certify in writing that work is complete and ready for inspection for substantial completion. Inspection shall be scheduled by the Architect/Engineer at their convenience.

C. Should deficiencies due to faulty equipment or installation require re-inspection after final inspection, all expenses of such re-inspection, including time and travel of the Architect/Engineer shall be the responsibility of the Manufacturer without cost to the Owner.

3.8 STAFF INSTRUCTION

A. The Manufacturer's supervisor shall instruct designated representatives of the Owner in the care and maintenance of all items.

B. The Architect/Engineer and other representatives may be present or represented.

C. Instruction shall be scheduled in conformance with test and instruction schedules, and availability of the Architect/Engineer and their representatives.

D. Confirmation of completed instruction must be obtained in writing from appropriate Owner’s Representative, with copies provided to the Architect and Theatre Consultant.

END OF SECTION 12 62 00

SECTION 12 63 13
PERMANENT GRANDSTANDS HOME SIDE
(I-Beam, interlocking decking, chairback seating)

A. GENERAL
1. The work consists of providing labor, materials, equipment, engineering, installation and supervision of an elevated galvanized I-beam bleacher system.
   a) Framing and substructure
   b) Decking system
   c) Seating
   d) Handrails/guardrails
   e) ADA Ramp

2. Building Codes
   a) Must meet or exceed all State and Local applicable codes and be in compliance with the International Building Code adopted by the jurisdiction. (IBC 2021)

3. Dimensions/Capacities
   a) The overall length of bleacher shall be as per architectural drawings
   b) The number of rows shall be as per architectural drawings
   c) Height of first row is 17” above front walkway
   d) The rise per row shall be as per architectural drawings
   e) The depth per row shall be as per architectural drawings
   f) Gross seating capacity shall be as per architectural drawings
   g) Front walkway elevation shall be as per architectural drawings

B. STRUCTURAL PERFORMANCE:
1. Design Loads/Structural – Framing Members
   a) Dead loading: 6 PSF for understructure.
   b) Live loads: 100 PSF for understructure

2. Design Loads/Semi-Closed Decking System
   a) Dead loading: 6 PSF for decking, platforms, and stairs.
   b) Live loads: 100 PSF for decking, platforms, and stairs.
   c) Deflection limits: engineer assemblies to withstand design loads with deflections no greater than the following:
      (1) Decking, platforms, and stairs: vertical deflection of L/240.
   d) Sway loads of 24 PLF per row parallel to seat and 10 PLF per row perpendicular to seat run.

3. Design Loads/Handrail/Guardrail
   a) 50 PLF in any direction.
   b) 200 LB concentrated load any direction

4. Design Loads/Seat Boards
   a) Live loads: 120 PLF for seating.

C. PROPOSAL DRAWINGS: Submit with bid proposal the following scheduled design plans:
1. Plan showing general design and seat locations
2. A decking and aisle layout plan.

   a) SUBMITTALS

b) Shop Drawings: Manufacturer to submit shop drawings sealed by a registered professional engineer in the applicable state and shall be of sufficient clarity to indicate location, nature, and extent of the work proposed and show in detail that it will conform to the applicable code and relevant laws.

D. PRODUCTS

1. ACCEPTABLE MANUFACTURERS
   a) Grandstands
      (1) All manufacturers must be preapproved by the Architect no later than 7 days prior to Bid Date.
   b) Chair Back Seating: Irwin Seating
      (1) Model: 22” width Patriot, or equal

E. PRODUCT DESCRIPTION (Permanent Steel Grandstand)
1. Substructure (Galvanized Steel I-Beam)
   a) Horizontal Beam Design: All horizontal beams are wide flange beams. Traverse bays are free of cross bracing the total length of the grandstand.
   b) Stringers: Stringers are wide flange with steel angle rise and depth fabrication and are placed at 6 feet on center maximum.
   c) Structural shapes shall meet one of the following ASTM specifications: A36, A36/A572 grade 50, A572 grade 50, A529-50, or A500 grade B.
   d) Shop connections are seal welds.
   e) After fabrication, all steel is hot-dipped galvanized to ASTM-A-123 specifications.
   f) Design to be stamped by state licensed engineer.
   g) Painted steel finish is unacceptable.

2. Decking: Interlocking Decking System
   a) Rise and depth per row: Refer to drawings.

3. CLOSED Aluminum Decking System
   a) Decking system platforms shall be an all-aluminum extrusions attached to the understructure by means of concealed aluminum clips, galvanized bolts, washers and nuts. The attachment of the riser to the platforms shall form a structurally integrated system.
   b) Platform shall have a minimum aluminum wall thickness of .078” and aluminum shall be alloy 6063-T6.
   c) Walking surface shall be fluted slip-resistant decking.
   d) The platforms shall have integral bolt runners, to allow for the attachment of seat supports, aisle steps and aisle handrails to be made without penetrating the decking system. Through bolting is prohibited.
   e) Deck shall allow for reconfiguration of seating and aisles without alteration of the understructure.

4. Decking System Riser
   a) The decking system riser shall be extruded aluminum: alloy 6063-T6 with a mill finish.
   b) The riser shall attach using extruded aluminum bolt clips, designed to clamp the riser to the supporting structure and hot dipped galvanized carriage bolts, and hex nuts or equal. Self-drilling fasteners are prohibited.
   c) The riser shall be structurally connected to every frame line.

5. Seating
   a) Each seat 17 inches above its respective tread
   b) Bench Seating:

(1) 2x10 aluminum seat
(2) Joint and splice sleeves required for continuous seating over 30’ in length

6. Guardrails/Handrails System
   a) All railing shall consist of 1-5/8” schedule 40 anodized pipe.
   b) All pipe fittings shall be of cast aluminum or equal.
   c) Guardrail supports to be 2x3” angle.
   d) Rail pipe shall be secured to the guardrail support by means of galvanized tension bands.
   e) The top rail shall be 42” minimum above the nearest seat on the sides and rear, and 42” above the tread on the front walkway.
   f) Handrails on stairs shall be 34” above the leading most edge of the stair tread.
   g) An aluminized chain link fence shall be provided on the front, sides and rear of the bleacher and at all egress areas.
   h) Handrails shall be provided at all walking areas and shall extend 1-1/2” from guardrail material. Standoff shall be extruded aluminum, alloy 6061-T6.
   i) Handrails shall have internal sleeves for splice purposes and finished rail shall be continuous and shall not exceed 1-5/8” diameter.

7. Clip Sets

   a) Clip sets shall adequately connect seat and foot planks to the supporting structure so as to transmit all design loads to the understructure members, as specified in the design section.
   b) All planks shall be connected to the supporting structure using four way adjustable clips, carriage bolts, and 5/16” galvanized nuts.
   c) Splice Connectors
      (1) Internal splices, where required, shall be two per joint, aluminum alloy 6061-T6 and shall penetrate the joint a minimum of 9” in each direction and be riveted at one end only to allow for contraction and expansions.

8. Front Walkway:
   a) Clear Width: Per Drawings
   b) Elevation: Per Drawings

9. Entry Stairs.
   a) Stair rise: per drawings with aluminum closure and contrasting aluminum stair nose.
   b) Stair tread depth: per drawings.
   c) Stairs to be firmly anchored to uniformly poured concrete bases.
   d) Guardrails on Stair to be 42 inches above leading edge of step.
   e) Stairs to have handrail extension. The top of the handrails and handrail extensions shall be placed not less than 34 inches or more than 38 inches above the nosing of the treads and landings.

10. Aisle:
    a) Aisle with seating on both sides to have discontinuous mid-aisle handrails.
    b) The handrails shall have breaks at intervals not to exceed 5 rows. These breaks shall have clear width of at least 22 inches and not greater than 36 inches horizontally.
    c) Handrails to have 34 inch top rail with an intermediate rail at approximately 22 inches above tread.
    d) Aluminum tread nosing of contrasting color on aisle steps.

e) Mid-Aisle steps shall be provided for riser heights above 8 inches and shall provide equal rise and run throughout the aisle. These steps shall have a riser closure to the sided edges of the half step with no recesses.

11. Ramp Design
    a) Slope: 1 in 12.
    b) Guardrail as required by code plus toe board
    c) The ramp system shall be designed to support, in addition to its own weight, a uniformity distributed live load of not less than 100 pounds per square foot of gross horizontal projection.
    d) All decking members shall sustain live loads of not less than 120 pounds per lineal foot, over a 6 foot span, multi-span condition.

12. ADA Provision
    a) Quantity of wheelchair spaces: see plans
    b) Riser area adjacent to wheelchair spaces to have intermediate construction so 4 in sphere cannot pass through opening.

13. Materials/Finishes
    a) Substructures:
        (1) Structural shapes shall meet one of the following ASTM specifications: A36, A36/A572 grade 50, A572 grade 50, A529-50, or A500 grade B.
        (2) Shop connections are seal welds.
        (3) After fabrication, all steel is hot-dipped galvanized to ASTM-A-123 specifications.
        (4) Painted steel finish is unacceptable.

    b) Extruded Aluminum:
        (1) Seat Planks, Extruded aluminum alloy, 6063-T6, Clear anodized 204R1, AA-M10C22A31, Class II.
        (2) Tread Planks: Extruded aluminum alloy, 6063-T6 mill finish.
        (3) Riser Planks: Extruded aluminum alloy, 6063-T6 mill finish.
        (4) Railing: Extruded aluminum alloy, 6063-T6 clear anodized 204R1, AA-M10C22A31, Class II
    c) Chairback Seating:
        (1) Irwin Patriot Series, 22” Chair Width
            (a) Blow-mold Patriot back
            (b) Blow-molded seat with torsion spring seat lift mechanism
            (c) Steel chair platform - Riser mounted
            (d) Blow-mold armrest attachment
14. Accessories
    a) Channel End Caps: Aluminum alloy 6063-T6, clear anodized 204R1, AA-M10C22A31, Class II.
15. Hardware:
    a) Bolts, Nuts: Hot-dipped galvanized or mechanically galvanized.
    b) Hold down clip assembly: Aluminum alloy 6005A-T6, mill finish
    c) Structural Hardware: Equal to or greater than hot-dipped galvanized ASTM-A307. No connections utilizing high strength bolts are classed as slip critical.
16. Aisle Nose and Stair Nose:
    a) Aluminum alloy, 6063-T6, non-skid black powder coated finish or other paint system meeting AAMA 603.8-92 specifications.

F. INSTALLATION

1. Installation must be performed by the Manufacturer, or industry professional with 10 years of experience.
2. All plank to be free of defects such as, but not limited to dents, scratches, water (moisture), and damage.
3. All surfaces to be cleaned prior to final inspection.
4. Inspection to be conducted by owner, state and/or county inspector, or any other designated person(s), elected by said owner.
5. Legally remove all packing material and construction type debris from owner's property.

G. WARRANTY
1. Permanent Grandstand shall be under warranty for a period of one year beginning at the Date of Substantial Completion for projects installed by Manufacturer. The grandstand is warranted to be free of defect in materials and workmanship in the course of manufacture. This warranty excludes any other defects resulting from abnormal use in service, accidental or intentional damage or any occurrences beyond Manufacturer's control.

H. MAINTENANCE
1. Owner is to conduct annual inspection and required maintenance of grandstand to ensure safe conditions. It is also recommended that a professional engineer or registered architect perform inspections biennially.

END OF SECTION

SECTION 12 63 13
PERMANENT GRANDSTANDS VISITOR SIDE
(Angle frame, interlocking decking)

A. GENERAL
1. The work consists of providing labor, materials, equipment, engineering, installation and supervision of an elevated angle bleacher system.
    a. Framing and substructure
    b. Decking system
    c. Seating
    d. Handrails/guardrails
    e. ADA Ramp

2. Building Codes
    a. Must meet or exceed all State and Local applicable codes and be in compliance with the International Building Code adopted by the jurisdiction. (IBC 2021)

3. Dimensions/Capacities
    a. The overall length of bleacher shall be as per architectural drawings
    b. The number of rows shall be as per architectural drawings
    c. Height of first row is 17” above front walkway
    d. The rise per row shall be as per architectural drawings
    e. The depth per row shall be as per architectural drawings
    f. Gross seating capacity shall be as per architectural drawings
    g. Front walkway elevation shall be as per architectural drawings

B. STRUCTURAL PERFORMANCE:
1. Design Loads/Structural – Framing Members
    a. Dead loading: 6 PSF for understructure.
    b. Live loads: 100 PSF for understructure

2. Design Loads/Semi-Closed Decking System
    a. Dead loading: 6 PSF for decking, platforms, and stairs.
    b. Live loads: 100 PSF for decking, platforms, and stairs.
    c. Deflection limits: engineer assemblies to withstand design loads with deflections no greater than the following:
        1. Decking, platforms, and stairs: vertical deflection of L/240.
    d. Sway loads of 24 PLF per row parallel to seat and 10 PLF per row perpendicular to seat run.

3. Design Loads/Handrail/Guardrail
    a. 50 PLF in any direction.
    b. 200 LB concentrated load any direction

4. Design Loads/Seat Boards
    a. Live loads: 120 PLF for seating.

C. PROPOSAL DRAWINGS: Submit with bid proposal the following scheduled design plans:
1. Plan showing general design and seat locations.
2. A decking and aisle layout plan.

D. SUBMITTALS
1. Shop Drawings: Manufacturer to submit shop drawings sealed by a registered professional engineer in the applicable state and shall be of sufficient clarity to indicate location, nature, and extent of the work proposed and show in detail that it will conform to the applicable code and relevant laws.

E. PRODUCTS

1. ACCEPTABLE MANUFACTURERS
    a. Grandstands
        1. All manufacturers must be preapproved by the Architect no later than 7 days prior to Bid Date.

F. PRODUCT DESCRIPTION (Permanent Angle Framed Grandstand)
1. Substructure (All-Aluminum Angle Frame)
    a. The understructure of the system shall consist of a series of aluminum frames spaced at intervals of no more than 6-0` and joined by means of aluminum sway braces.
    b. Each frame shall consist of vertical members, adequate diagonal braces, and horizontal members welded to form the rise per row and back-to-back spacing between seat rows as indicated.
    c. All welded connections shall be by certified aluminum welders, and all mating parts shall be welded on all sides to assure adequate strength.
    d. Vertical members shall be constructed on a minimum of 2” x 2” x 3/16” angle aluminum, alloy 6061-T6, mill finish.
    e. Horizontal members shall be constructed of 2” x 2” x 3/16” or larger aluminum, alloy 6061-T6, mill finish.
    f. Sway braces shall be constructed of 1 ½” x 1 ½” x 3/16” aluminum angle, alloy 6061-T6, mill finish.

2. Decking: Interlocking Decking System
    a. Rise and depth per row: Refer to drawings.

3. CLOSED Aluminum Decking System
    a. Decking system platforms shall be an all-aluminum extrusions attached to the understructure by means of concealed aluminum clips, galvanized bolts, washers and nuts. The attachment of the riser to the platforms shall form a structurally integrated system.
    b. Platform shall have a minimum aluminum wall thickness of .078” and aluminum shall be alloy 6063-T6.
    c. Walking surface shall be fluted slip-resistant decking.
    d. The platforms shall have integral bolt runners, to allow for the attachment of seat supports, aisle steps and aisle handrails to be made without penetrating the decking system. Through bolting is prohibited.
    e. Deck shall allow for reconfiguration of seating and aisles without alteration of the understructure.

4. Decking System Riser
    a. The decking system riser shall be extruded aluminum: alloy 6063-T6 with a mill finish.
    b. The riser shall attach using extruded aluminum bolt clips, designed to clamp the riser to the supporting structure and hot dipped galvanized carriage bolts, and hex nuts or equal. Self-drilling fasteners are prohibited.
    c. The riser shall be structurally connected to every frame line.

5. Seating
    a. Each seat 17 inches above its respective tread
    b. Bench Seating:
        1. 2x10 aluminum seat
        2. Joint and splice sleeves required for continuous seating over 30’ in length

6. Guardrails/Handrails System
    a. All railing shall consist of 1-5/8” schedule 40 anodized pipe.
    b. All pipe fittings shall be of cast aluminum or equal.
    c. Guardrail supports to be 2x3” angle.
    d. Rail pipe shall be secured to the guardrail support by means of galvanized tension bands.
    e. The top rail shall be 42” minimum above the nearest seat on the sides and rear, and 42” above the tread on the front walkway.
    f. Handrails on stairs shall be 34” above the leading most edge of the stair tread.
    g. An aluminized chain link fence shall be provided on the front, sides and rear of the bleacher and at all egress areas.
    h. Handrails shall be provided at all walking areas and shall extend 1-1/2” from guardrail material. Standoff shall be extruded aluminum, alloy 6061-T6.
    i. Handrails shall have internal sleeves for splice purposes and finished rail shall be continuous and shall not exceed 1-5/8” diameter.

7. Clip Sets

    a. Clip sets shall adequately connect seat and foot planks to the supporting structure so as to transmit all design loads to the understructure members, as specified in the design section.
    b. All planks shall be connected to the supporting structure using four way adjustable clips, carriage bolts, and 5/16” galvanized nuts.
    c. Splice Connectors
        1. Internal splices, where required, shall be two per joint, aluminum alloy 6061-T6 and shall penetrate the joint a minimum of 9” in each direction and be riveted at one end only to allow for contraction and expansions.

8. Front Walkway:
    a. Clear Width: Per Drawings
    b. Elevation: Per Drawings

9. Entry Stairs.
    a. Stair rise: per drawings with aluminum closure and contrasting aluminum stair nose.
    b. Stair tread depth: per drawings.
    c. Stairs to be firmly anchored to uniformly poured concrete bases.
    d. Guardrails on Stair to be 42 inches above leading edge of step.
    e. Stairs to have handrail extension. The top of the handrails and handrail extensions shall be placed not less than 34 inches or more than 38 inches above the nosing of the treads and landings.

10. Aisle:
    a. Aisle with seating on both sides to have discontinuous mid-aisle handrails.

b. The handrails shall have breaks at intervals not to exceed 5 rows. These breaks shall have clear width of at least 22 inches and not greater than 36 inches horizontally.
c. Handrails to have 34 inch top rail with an intermediate rail at approximately 22 inches above tread.
d. Aluminum tread nosing of contrasting color on aisle steps.
e. Mid-Aisle steps shall be provided for riser heights above 8 inches and shall provide equal rise and run throughout the aisle. These steps shall have a riser closure to the sided edges of the half step with no recesses.

11. Ramp Design
    a. Slope: 1 in 12.
    b. Guardrail as required by code plus toe board
    c. The ramp system shall be designed to support, in addition to its own weight, a uniformity distributed live load of not less than 100 pounds per square foot of gross horizontal projection.
    d. All decking members shall sustain live loads of not less than 120 pounds per lineal foot, over a 6 foot span, multi-span condition.

12. ADA Provision
    a. Quantity of wheelchair spaces: see plans
    b. Riser area adjacent to wheelchair spaces to have intermediate construction so 4 in sphere cannot pass through opening.

13. Materials/Finishes
    a. Substructures:
        1. All welded connections shall be by certified aluminum welders, and all mating parts shall be welded on all sides to assure adequate strength.
        2. Vertical members shall be constructed on a minimum of 2” x 2” x 3/16” angle aluminum, alloy 6061-T6, mill finish.
        3. Horizontal members shall be constructed of 2” x 2” x 3/16” or larger aluminum, alloy 6061-T6, mill finish.
        4. Sway braces shall be constructed of 1 ½” x 1 ½” x 3/16” aluminum angle, alloy 6061-T6, mill finish.

    b. Extruded Aluminum:
        1. Seat Planks, Extruded aluminum alloy, 6063-T6, Clear anodized 204R1, AA-M10C22A31, Class II.
        2. Tread Planks: Extruded aluminum alloy, 6063-T6 mill finish.
        3. Riser Planks: Extruded aluminum alloy, 6063-T6 mill finish.
        4. Railing: Extruded aluminum alloy, 6063-T6 clear anodized 204R1, AA-M10C22A31, Class II
14. Accessories
    a. Channel End Caps: Aluminum alloy 6063-T6, clear anodized 204R1, AA-M10C22A31, Class II.
15. Hardware:
    a. Bolts, Nuts: Hot-dipped galvanized or mechanically galvanized.
    b. Hold down clip assembly: Aluminum alloy 6005A-T6, mill finish
    c. Structural Hardware: Equal to or greater than hot-dipped galvanized ASTM-A307. No connections utilizing high strength bolts are classed as slip critical.
16. Aisle Nose and Stair Nose:
    a. Aluminum alloy, 6063-T6, non-skid black powder coated finish or other paint system meeting AAMA 603.8-92 specifications.

G. INSTALLATION
1. Installation must be performed by the Manufacturer, or industry professional with 10 years of experience.
2. All plank to be free of defects such as, but not limited to dents, scratches, water (moisture), and damage.
3. All surfaces to be cleaned prior to final inspection.
4. Inspection to be conducted by owner, state and/or county inspector, or any other designated person(s), elected by said owner.
5. Legally remove all packing material and construction type debris from owner's property.

H. WARRANTY
1. Permanent Grandstand shall be under warranty for a period of one year beginning at the Date of Substantial Completion for projects installed by Manufacturer. The grandstand is warranted to be free of defect in materials and workmanship in the course of manufacture. This warranty excludes any other defects resulting from abnormal use in service, accidental or intentional damage or any occurrences beyond Manufacturer's control.

I. MAINTENANCE
1. Owner is to conduct annual inspection and required maintenance of grandstand to ensure safe conditions. It is also recommended that a professional engineer or registered architect perform inspections biennially.

END OF SECTION

SECTION 14 21 00

Electric Traction Elevators

PART 1 - GENERAL

1.01 Summary

A. This section specifies electric traction elevators.

B. Work Required

1- The work required under this section consists of all labor, materials and services required for the complete installation (including operational verification) of all the equipment required for the elevator(s) as herein specified.

2- All work shall be performed in a first class, safe and workmanlike manner.

3- In all cases where a device or part of the equipment is herein referred to in the singular, it is intended that such reference shall apply to as many of such devices or parts as are required to make complete installation.

1.02 Related Sections

A. The following sections contain requirements that relate to this section and are performed by trades other than the elevator manufacturer/installer.

1- Section 01 50 00 – Temporary Facilities and Controls: protection of floor openings and personnel barriers; temporary power and lighting.

2- Section 03 30 00 – Cast-In-Place Concrete: elevator pit and elevator machine foundation.

3- Section 04 20 00 – Unit Masonry: masonry hoistway enclosure, building-in and grouting hoistway doorframes, and grouting of sills.

4- Section 05 50 00 – Metal Fabrications: pit ladder, divider beams, supports for entrances and rails, and hoisting beam at top of elevator hoistway.

5- Section 07 16 00 – Cementitious Waterproofing: waterproofing of elevator pit.

6- Section 23 50 00 – Heat Generation Equipment: ventilation and temperature control of elevator equipment areas.

7- Section 26 05 00 – Common Work Results for Electrical:

a. Main disconnects for each elevator.

b. Electrical power for elevator installation and testing.

c. Disconnecting device to elevator equipment prior to activation of sprinkler system.

d. The installation of dedicated GFCI receptacles in the pit and overhead.

e. Lighting in controller area, machine area and pit.

f. Wiring for telephone service to controller (if applicable).

8- Section 26 30 00 – Emergency (Standby) Power Supply Systems: emergency generator for elevator operation.

9- Section 27 30 00 – Voice Communications: ADAAG-required emergency communications equipment.

10- Section 28 31 00 – Fire Alarm Systems: fire and smoke detectors at required locations and interconnecting devices; fire alarm signal lines to contacts in the machine area.

11- Section 31 10 00 – Site Clearing: excavation for elevator pit.

1.03 References

A. Comply with applicable building and elevator codes at the project site, including but not limited to the following:

1- ASME A17.1/CSA B44, Safety Code for Elevators and Escalators.

2- ASME A17.7/CSA B44, Performance-Based Safety Code for Elevators and Escalators.

3- ADAAG, American Disabilities Act Accessibility Guidelines.

4- ANSI A117.1, Building and Facilities, Providing Accessibility and Usability for Physically Handicapped People.

5- ANSI/NFPA 70, (NEC) National Electrical Code.

6- CAN/CSA C22.1, (CEC) Canadian Electrical Code.

7- ANSI/UL 10B, Standard for Fire Test of Door Assemblies.

8- CAN/ULC-S104-10, Standard Method for Fire Test of Door Assemblies.

9- ANSI/NFPA 80, Standard for Fire Doors and Other Opening Protectives.

10- Building Codes IBC or NBCC.

11- All Local Jurisdictional applicable codes.

1.04 System Description

A. Equipment Description: Gen3 Core™ gearless machineroom less elevator where all components fit inside the hoistway.

B. Equipment Control: Elevonic® Control System.

C. IoT Connectivity: Elevator connected to Otis ONE IoT Platform

D. Drive: Regenerative

E. Quantity of Elevators: 1

F. Elevator Stop Designations: 3, 2, 1

G. Stops: 3

H. Openings: Front and Rear

I. Travel: 38’-0” (11582 mm)

J. Pit Depth: 5’-0” (1524 mm)

K. Rated Capacity: 3000 lb (1362 kg)

L. Rated Speed: 200 fpm (1.02 m/s)

M. Laminate Cab Clear Inside Dimensions: 6’-5 9/16” Width x 5’-0 ¾” Depth (1970 mm Width x 1534 mm Depth)

N. Cab Height: 7’-9” (2362 mm)

O. Clear Cab Height: 7’-8 ⅛” (2340 mm) with 1 ¼” (32 mm) Floor Recess and 4 LED Ceiling

P. Entrance Type and Width: Center-Opening Doors – 42” (1067 mm)

Q. Entrance Height: 7’-0” (2134 mm)

R. Main Power Supply: 480 volts □ 5% of normal, three-phase, with a separate equipment grounding conductor.

S. Car Lighting Power Supply: 120 volts, single-phase, 15 amps, 60 Hz.

T. Machine Location: Rail-mounted at the top of the hoistway.

U. Signal Fixtures: Manufacturer's standard with metal button targets (excluding CA).

V. Controller Location: Machine Roomless controller(s) must be jamb-mounted on the same side as the counterweight, located at the top landing.

W. Performance:

1- Car Speed: □ 3 % of contract speed under any loading condition or direction of travel.

2- Car Capacity: Safely lower, stop and hold up to 120% of rated load (code required).

3- Ride Quality:

a. Vertical Vibration (maximum): 20 milli-g

b. Horizontal Vibration (maximum): 12 milli-g

c. Vertical Jerk (maximum): 4.59 □ 1.0 ft./ sec^3 (1.4 □ 0.3 m/ sec^3)

d. Acceleration/Deceleration (maximum): 2.62 ft./ sec^2 (0.8 m/ sec^2)

e. In Car Noise: 55 – 60 dB(A)

f. Stopping Accuracy: □ 0.375 in. (□ 10 mm) max, □ 0.25 in. (□ 6 mm) Typical

g. Re-leveling Distance: □ 0.5 in. (□ 12 mm)

X. Operation: Simplex Collective Operation: Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.

Y. Operation Features – Standard

1- Full Collective Operation

2- Anti-nuisance.

3- Fan and Light Protection.

4- Load Weighing Bypass.

5- Independent Service.

6- Firefighters' Service Phase I and Phase II (USA only); or Special Emergency Service Phase I and II – Emergency Recall and In-Car Emergency Operation (Canada only).

7- Top of Car Inspection.

8- Zoned Access at Bottom Landing.

9- Zoned Access at Top Landing

Z. Operation Features – Optional

1- Express Priority Service with key-switch(es)

2- Emergency Hospital Service.

3- Automatic Rescue Operation

4- Automatic Standby Power Operation with Manual Override.

AA. Door Control Features:

1- Door control to open doors automatically when car arrives at a landing in response to a normal hall or car call.

2- Elevator doors shall be provided with a reopening device that will stop and reopen the car door(s) and hoistway door(s) automatically should the door(s) become obstructed by an object or person.

3- Door protection shall consist of a two-dimensional or a code required, three-dimensional, multi-beam array projecting across the car door opening.

4- Door nudging operation to occur if doors are prevented from closing for an adjustable period of time.

BB. Provide equipment for seismic conditions: Yes

1.05 Submittals

A. Product Data: Submit manufacturer’s product data for each system proposed for use. Include the following:

1- Signal and operating fixtures, operating panels and indicators.

2- Cab design, dimensions and layout.

3- Hoistway-door and frame details.

4- Electrical characteristics and connection requirements.

5- Expected heat dissipation of elevator equipment in hoistway (BTU).

6- Color selection chart for Cab and Entrances.

B. Shop Drawings: Submit approval layout drawings. Include the following:

1- Car, guide rails, buffers, and other components in hoistway.

2- Maximum rail bracket spacing.

3- Maximum loads imposed on guide rails requiring load transfer to building structure.

4- Clearances and travel of car.

5- Clear inside hoistway and pit dimensions.

6- Location and sizes of access doors, hoistway entrances and frames.

C. Operations and Maintenance Manuals: Provide manufacturer's standard operations and maintenance manual.

1.06 Quality Assurance

A. Manufacturer: Elevator manufacturer shall be ISO 9001 certified.

B. Manufacturer shall have a minimum of fifteen years of experience in the fabrication, installation and service of elevators.

C. Installer: Elevators shall be installed by the manufacturer.

D. Permits, Inspections and Certificates: The Elevator Contractor shall obtain and pay for necessary Municipal or State Inspection and permit as required by the elevator inspection authority, and make such tests as are called for by the regulations of such authorities. These tests shall be made in the presence of such authorities or their authorized representatives.

1.07 Delivery, Storage, and Handling

A. Should the building or the site not be prepared to receive the elevator equipment at the agreed upon date, the General Contractor will be responsible to provide a proper and suitable storage area on or off the premises.

B. Should the storage area be off-site, and the equipment not yet delivered, then the elevator contractor, upon notification from the General Contractor, will divert the elevator equipment to the storage area. If the equipment has already been delivered to the site, then the General Contractor shall transport the elevator equipment to the storage area. The cost of elevator

equipment taken to storage by either party, storage, and redeliver to the job site shall not be at the expense of the elevator contractor.

1.08 Warranty

A. The elevator contractor's acceptance is conditional on the understanding that their warranty covers defective material and workmanship. The warranty period shall not extend longer than one (1) year from the date of completion or acceptance thereof by beneficial use, whichever is earlier, of each elevator. The warranty excludes: ordinary wear and tear, improper use, vandalism, abuse, misuse, or neglect or any other causes beyond the control of the elevator contractor and this express warranty is in lieu of all other warranties, express or implied, including any warranty of merchantability or fitness for a particular purpose.

1.09 Maintenance and Service

A. Maintenance service consisting of regular examinations and adjustments of the elevator equipment shall be provided by the elevator contractor for a period of 12 Months after the elevator has been turned over for the customer's use. This service shall not be subcontracted but shall be performed by the elevator contractor. All work shall be performed by competent employees during regular working hours of regular working days. This service shall not cover adjustments, repairs, or replacement of parts due to negligence, misuse, abuse or accidents caused by persons other than the elevator contractor. Only genuine parts and supplies as used in the manufacture and installation of the original equipment shall be provided.

B. The periodic lubrication of elevator components shall not be required, including Sheaves, Rails, Belts, Ropes, Car and Counterweight guides, etc.

C. The elevator control system must:

1- Provide in the controller the necessary devices to run the elevator on inspection operation.

2- Provide on top of the car the necessary devices to run the elevator in inspection operation.

3- Provide in the controller an emergency stop switch. This emergency stop switch when opened disconnects power from the brake and prevents the motor from running.

4- Provide in the event of a power outage, means from the controller to electrically lift and control the elevator brake to safely bring the elevator to the nearest available landing.

5- Provide the means from the controller to reset the governor over speed switch and also trip the governor.

6- Provide the means from the controller to reset the emergency brake when set because of an unintended car movement or ascending car over speed.

7- (Optional) Provide the means from the controller to reset elevator earthquake operation.

PART 2 - PRODUCTS

2.01 Manufacturer

A. Manufacturer: Design based upon Otis Elevator's Gen3 Core™ machine room-less elevator system.

2.02 Design and Specifications

A. Provide Gen3™ Core traction passenger elevators from Otis Elevator Company. The control system and car design based on materials and systems manufactured by Otis Elevator Company. Specifically, the system shall consist of the following components:

1- Controller located entirely inside the hoistway.

2- An AC gearless machine using embedded permanent magnets mounted at the top of the hoistway.

3- Polyurethane Coated-Steel Belts for elevator hoisting purposes.

4- Regenerative drive that captures normally wasted energy and feeds clean power back into the building's power grid.

5- LED lighting standard in ceiling lights and elevator fixtures.

6- Sleep mode operation for LED ceiling lights and car fan.

B. Approved Installer: Otis Elevator Company

2.03 Equipment: Controller Components

A. Controller: A microcomputer-based control system shall be provided to perform all of the functions of safe elevator operation. The system shall also perform car and group operational control.

1- All high voltage (110V or above) contact points inside the controller shall be protected from accidental contact when the controller doors are open.

2- Controller shall be separated into two distinct halves: Motor Drive side and Control side. High voltage motor power conductors shall be routed so as to be physically segregated from the rest of the controller.

3- Field conductor terminations points shall be segregated; high voltage (>30 volts DC and 110 VAC,) and low voltage (< 30 volts DC)

4- Controllers shall be designed and tested for Electromagnetic Interference (EMI) immunity according to the EN 12016 (May 1998): "EMC Product Family Standards for lifts, escalators, and passenger conveyors Part 2 – immunity"

5- Controller shall be located inside the wall next to the top landing entrance frame. Emergency access shall be provided through an access panel in the entrance frame secured by a key lock.

6- A separate control room, space or closet is an option.

B. Drive: A Variable Voltage Variable Frequency AC drive system shall be provided. The drive shall be set up for regeneration of AC power back to the building grid.

2.04 Equipment: Hoistway Components

A. Machine: AC gearless machine, with a synchronous permanent-magnet motor, dual solenoid service and emergency disc brakes, mounted at the top of the hoistway.

B. Governor: The governor shall be a tension type car-mounted governor.

C. Buffers, Car, and Counterweight: Polyurethane type buffers shall be used for speeds of 150 and 200 feet per minute.

D. Hoistway Operating Devices:

1- Emergency stop switch in the pit.

2- Terminal stopping switches.

E. Positioning System: Consists of an encoder, reader box, and door zone vanes.

F. Guide Rails and Attachments: Guide rails shall be Tee-section steel rails with brackets and fasteners. Side counterweight arrangements shall have a dual-purpose bracket that combines both counterweight guide rails, and one of the car guide rails to building fastening.

G. Coated-Steel Belts: Polyurethane coated belts with high-tensile-grade, zinc-plated steel cords and a flat profile on the running surface and the backside of the belt. The belts shall have an FT-1 rating as referenced by NFPA 13. All driving sheaves and deflector sheaves should have a crowned profile to ensure center tracking of the belts. A continuous 24/7 monitoring system using resistance-based technology has to be installed to continuously monitor the integrity of the coated steel belts and provide advanced notice of belt wear.

H. Governor Rope: Shall be steel and shall consist of at least eight strands wound about a sisal core center.

I. Fascia: Galvanized sheet steel shall be provided in accordance with code requirements.

J. Hoistway Entrances:

1- Frames: Entrance frames shall be of bolted construction for complete one-piece unit assembly. All frames shall be securely fastened to fixing angles mounted in the hoistway and shall be of UL fire rated steel. The entrance profile (jamb face) shall be a width of 2 7/8” (73 mm).

2- Sills shall be extruded aluminum.

3- Doors: Entrance doors shall be of metal construction with vertical channel reinforcements.

4- Fire Rating: Entrance and doors shall be UL fire rated for 1-½ hour

5- Entrance Finish: Brushed Stainless Steel

6- Entrance Marking Plates: Entrance jambs shall be marked with 4” x 4” (102 mm x 102 mm) plates having raised floor markings with Braille located adjacent to the floor marking. Marking plates shall be provided on both sides of the entrance.

7- Sight Guards: Sight guards will be furnished with all doors painted to match with painted doors, painted black for stainless steel doors.

2.05 Equipment: Car Components

C. Car Frame and Safety: A car frame fabricated from formed or structural steel members shall be provided with adequate bracing to support the platform and car enclosures. The car safety shall be integral to the car frame and shall be Type "B", flexible guide clamp type.

D. Cab: Laminate Cab with vertical high-pressure laminate wall panels; laminated woodgrains, patterns and solid selections available from the manufacturer’s standard selection chart.

E. Car Front Finish: Brushed Stainless Steel

F. Car Door Finish: Brushed Stainless Steel

G. Flush Ceiling with 4 LED Lights

H. Ceiling Finish: Brushed Stainless Steel

G. Emergency Car Lighting: An emergency power unit employing a 6-volt sealed rechargeable battery and totally static circuits shall be provided to illuminate the elevator car in the event of building power failure.

H. Fan: A one-speed 120 VAC fan will be mounted to the ceiling to facilitate in-car air circulation, meeting A17.1 code requirements. The fan shall be rubber mounted to prevent the transmission of structural vibration and will include a baffle to diffuse audible noise. A switch shall be provided in the car-operating panel to control the fan.

I. Handrails: Provided on the side walls of the car enclosure. They shall be, 1 ½” diameter (38.1 mm) Round Bar Handrail s with a Brushed Steel Finish.

A. Threshold: Extruded Aluminum

J. Emergency Exit Contact: An electrical contact shall be provided on the car-top exit.

K. Guides: The car shall have 3” diameter roller guides at top and bottom and the counterweight shall have slide type guides at the top and the bottom. Optional counterweight guides available.

L. Platform: The car platform shall be constructed of metal. Load weighing device shall be mounted on the belts at the top of the hoistway.

M. The LED ceiling lights, and the fan should automatically shut off when the system is not in use and be powered back up after a passenger calls the elevator and pushes a hall button.

Note: Below are optional.

N. Certificate frame: Provide a Certificate frame with a satin stainless steel finish.

O. Otis cab UVC light purification device

P. Otis cab air purifier

Q. Elevator Cab Pads

2.06 Equipment: Signal Devices and Fixtures

A. Car Operating Panel: A Standard Otis ONE™ Pro flat applied car operating panel with a surrounding injected molded bezel shall be provided which contains all push buttons, key switches, and message indicators for elevator operation. The car operating panel shall have a brushed stainless steel finish and include a service cabinet. (A second COP is available)

1- The car operating panel shall contain a bank of round stainless steel, mechanical LED illuminated buttons. Flush mounted to the panel and marked to correspond to the landings served. All buttons to have raised numerals and Braille markings with:

Flush Mounted brushed stainless steel buttons with white LED illuminating halos.

Lexan ⅛" (3mm) projecting fully illuminated buttons with white LEDs may be required by some local codes

2- The car operating panel shall be equipped with the following features:

a. Raised markings and Braille to the left-hand side of each push-button.

b. Car Position Indicator at the top of and integral to the car operating panel.

c. Door open and door close buttons.

d. Inspection key-switch.

e. Elevator Data Plate marked with elevator capacity and car number.

f. Help Button: The help button shall initiate two-way communication between the car and a location inside the building, switching over to another location if the call is unanswered, where personnel are available who can take the appropriate action. Visual indicators are provided for call initiation and call acknowledgement.

g. Display Screen: Include display screen located near the top of the COP. The display screen shall display the car position indicator, travel direction arrows, elevator status jewels, and provide emergency text communication.

h. Camera: Include camera located above display screen for emergency video communication. This camera is for emergency communication only.

i. Landing Passing Signal: A chime bell shall sound in the car to signal that the car is either stopping at or passing a floor served by the elevator.

Note: Below are Standard for USA and optional in Canada.

j. In car stop switch (toggle or key unless local code prohibits use)

k. Firefighter's hat (standard USA)

l. Firefighter's Phase II Key-switch (standard USA)

m. Call Cancel Button (standard USA)

Note: Below are optional.

n. Firefighter's Phase II Emergency In-Car Operating Instructions: worded according to A17.1 2000, Article 2.27.7.2.

o. Please Exit Symbol: provided with emergency hospital service, or express priority in the hall.

B. Car Position Indicator: A digital, LED car position indicator shall be integral to the car operating panel.

C. Hall Fixtures: Hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. Hall fixtures shall include:

Round stainless steel, mechanical buttons located in the entrance frame face mounted vertically. Fixtures shall be brushed stainless steel finish.

Flush Mounted brushed stainless steel buttons with white LED illuminating halos.

Lexan ⅛" (3mm) projecting fully illuminated buttons with white LEDs may be required by some local codes.

1- Car Lantern and Chime: A directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel, and a chime will sound.

D. Access key-switch at top floor in entrance jamb is optional.

E. Access key-switch at lowest floor in entrance jamb is optional.

F. Card Reader Provision is Optional

G. Optional Emergency Hospital Service

H. Earthquake Slow Speed Operation (Optional in California only)

PART 3 - EXECUTION

3.01 Preparation

A. Take field dimensions and examine conditions of substrates, supports, and other conditions under which this work is to be performed. Do not proceed with work until unsatisfactory conditions are corrected.

3.02 Installation

A. Installation of all elevator components except as specifically provided for elsewhere by others.

3.03 Demonstration

A. The elevator contractor shall make a final check of each elevator operation with the Owner or Owner's representative present prior to turning each elevator over for use. The elevator contractor shall determine that control systems and operating devices are functioning properly.

END OF SECTION

SECTION 21 0500
COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Above ground piping.
B. Buried piping.
C. Escutcheons.
D. Expansions - hose and braid.
E. Mechanical couplings.
F. Pipe hangers and supports.
G. Pipe sleeves.
H. Pipe sleeve-seal systems.
I. Piping specialties.
J. Pressure gauges.

1.02 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.
B. Section 09 9123 - Interior Painting: Preparation and painting of interior fire protection piping systems.
C. Section 21 0553 - Identification for Fire Suppression Piping and Equipment: Piping identification.
D. Section 21 1300 - Fire-Suppression Sprinkler Systems: Sprinkler systems design.

1.03 REFERENCE STANDARDS

A. ASME A112.18.1 - Plumbing Supply Fittings; 2018, with Errata.
B. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2022.
C. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2023.
D. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.
E. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.
F. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2021.
G. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard; 2020.
H. ASME B16.9 - Factory-Made Wrought Buttwelding Fittings; 2018.
I. ASME B16.11 - Forged Fittings, Socket-Welding and Threaded; 2021.
J. ASME B16.25 - Buttwelding Ends; 2022.
K. ASME B36.10M - Welded and Seamless Wrought Steel Pipe; 2022.
L. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).
M. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
N. ASTM A135/A135M - Standard Specification for Electric-Resistance-Welded Steel Pipe; 2021.
O. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2023a.

P. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984, with Editorial Revision (2019).

Q. ASTM A795/A795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use; 2021.

R. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2022).

S. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2018.

T. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2021.

U. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2017.

V. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2017, with Errata (2018).

W. AWWA C606 - Grooved and Shouldered Joints; 2022.

X. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

Y. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems; 2019, with Amendment.

Z. NFPA 1963 - Standard for Fire Hose Connections; 2019.

AA. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Current Edition, Including All Revisions.

BB. UL 405 - Standard for Safety Fire Department Connection Devices; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's catalog information. Indicate valve data and ratings.

C. Shop Drawings: Indicate pipe materials used, jointing methods, supports, and floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

D. Manufacturer's qualification statement.

E. Installer's qualification statement.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section.
   1. Minimum three years experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary protective coating on cast iron and steel valves.

B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Sprinkler-based System:
   1. Comply with NFPA 13.
   2. See Section 21 1300.

B. Combined Sprinkler, Standpipe, and Hose System:
   1. Comply with NFPA 13 and NFPA 14.
   2. See Sections 21 1300 and 21 1200.

C. Welding Materials and Procedures: Comply with ASME BPVC-IX.

D. Provide system pipes, fittings, sleeves, escutcheons, seals, and other related accessories.

2.02 BURIED PIPING

A. Steel Pipe: ASTM A53/A53M Schedule 40, ASTM A135/A135M Schedule 10, ASTM A795/A795M Standard Weight, or ASME B36.10M Schedule 40, black, with AWWA C105/A21.5 polyethylene jacket, or double layer, half-lapped polyethylene tape.
   1. Steel Fittings: ASME B16.9, wrought steel, buttwelded, ASME B16.25, buttweld ends, ASTM A234/A234M, wrought carbon steel or alloy steel, ASME B16.5, steel flanges and fittings, or ASME B16.11, forged steel socket welded and threaded; with double layer, half-lapped polyethylene tape.
   2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings.
   3. Joints: Welded in accordance with AWS D1.1/D1.1M.

B. Ductile Iron Pipe: AWWA C151/A21.51.
   1. Fittings: AWWA C110/A21.10, standard thickness.
   2. Joints: AWWA C111/A21.11, styrene-butadiene rubber (SBR) or vulcanized SBR gasket.
   3. Mechanical Couplings: Shaped composition sealing gasket, steel bolts, nuts, and washers.

2.03 ABOVE GROUND PIPING

A. Steel Pipe: ASTM A795 Schedule 40, black.
   1. Steel Fittings: ASME B16.5 steel flanges and fittings.
   2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.
   3. Malleable Iron Fittings: ASME B16.3, threaded fittings and ASTM A47/A47M.
   4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.
   5. Mechanical Formed Fittings: Carbon steel housing with integral pipe stop and O-ring pocked and O-ring, uniformly compressed into permanent mechanical engagement onto pipe.

2.04 PIPE SLEEVES

A. Vertical Piping:
   1. Sleeve Length: 1 inch (25 mm) above finished floor.
   2. Provide sealant for watertight joint.
   3. Blocked Out Floor Openings: Provide 1-1/2 inch (40 mm) angle set in silicon adhesive around opening.

B. Pipe Passing Through Below Grade Exterior Walls:
   1. Zinc-coated or cast-iron pipe.
   2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.

C. Pipe Passing Through Mechanical and Laundry:
   1. Galvanized steel pipe or black iron pipe with asphalt coating.
   2. Connect sleeve with floor plate except in mechanical rooms.

2.05 PIPE SLEEVE-SEAL SYSTEMS

A. Modular Mechanical Seals:
   1. Elastomer-based interlocking links to continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
   2. Watertight seal between pipe and wall-sleeve, wall or casing opening.
   3. Size and select seal component materials in accordance with service requirements.
   4. Service Requirements:
      a. Underground, buried, and wet conditions.
   5. Glass-reinforced plastic pressure end plates.

B. Wall Sleeve: PVC material with waterstop collar, and nailer end caps.

C. Sleeve-Forming Disk: Nonconductive plastic-based material, 3 inch (76.2 mm) thick.

D. Pipeline-Casing Seals:
   1. End Seals: 1/8 inch (3.1 mm), pull-on type, rubber or synthetic rubber based.

2.06 ESCUTCHEONS

A. Material:
   1. Metals and Finish: Comply with ASME A112.18.1.

B. Construction:
   1. One-piece for mounting on chrome-plated tubing or pipe and one-piece or split-pattern type elsewhere.
   2. Internal spring tension devices or setscrews to maintain a fixed position against a surface.

2.07 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm): Malleable iron, adjustable swivel, split ring.

B. Hangers for Pipe Sizes 2 inches (50 mm) and Over: Carbon steel, adjustable, clevis.

C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

D. Wall Support for Pipe Sizes to 3 inches (80 mm): Cast iron hook.

E. Wall Support for Pipe Sizes 4 inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.

F. Vertical Support: Steel riser clamp.

G. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

2.08 EXPANSION JOINTS AND LOOPS - HOSE AND BRAID

A. Provide flexible loops with two flexible sections of hose and braid, two 90-degree elbows, and 180-degree return with support bracket and air release or drain plug.

B. Flexible Connectors: Flanged, braided type with wetted components of stainless steel, sized to match piping.
   1. Maximum Allowable Working Pressure: 150 psig (1030 kPa) at 120 degrees F (49 degrees C).
   2. Accommodate the Following:
      a. Axial Deflection in Compression and Expansion: _____ inch (_____ mm).
      b. Lateral Movement: _____ inch (_____ mm).
      c. Angular Rotation: 15 degrees.
      d. Force developed by 1.5 times specified maximum allowable operating pressure.
   3. Provide necessary accessories including, but not limited to, swivel joints.

2.09 MECHANICAL COUPLINGS

A. Rigid Mechanical Couplings for Grooved Joints:
   1. Dimensions and Testing: Comply with AWWA C606.
   2. Minimum Working Pressure: 300 psig (2065 kPa).
   3. Housing Material: Fabricate of ductile iron complying with ASTM A536.
   4. Housing Coating: Factory applied orange enamel.
   5. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F (minus 34 degrees C) to 230 degrees F (110 degrees C).
   6. Bolts and Nuts: Hot-dipped-galvanized or zinc-electroplated steel.

2.10 PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber-faced clapper to automatically actuate water motor alarm, pressure retard chamber and variable pressure trim with the following additional capabilities and features:

1. Activate electric alarm.
2. Test and drain valve.
3. Replaceable internal components without removing valve from installed position.

B. Dry Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber-faced clapper to automatically actuate water motor alarm, accelerator, and with the following additional capabilities and features:
1. Activate electric alarm.
2. Test and drain valve.
3. Externally resettable.
4. Replaceable internal components without removing valve from installed position.

C. Auxiliary Drains: Condensate collection drain for each section of trapped pipe in preaction or dry fire protection system.

D. Backflow Preventer: Reduced-pressure principle valve assembly backflow preventer with drain and OS & Y gate valve on each end.

E. Test Connections:
1. Inspector's Test Connection for Preaction and Dry Pipe Systems:
a. Provide test connections approximately 6 feet (2 m) above floor for each or portion of each sprinkler system equipped with an alarm device, located at most remote part of each system.
b. Route test connection to an open-site drain location, excluding janitor sinks, accepting full flow without negative consequences.
c. Supply discharge orifice with same size as corresponding sprinkler orifice.
d. Limit vertical height of exterior wall penetration to 2 feet (0.61 m) above finished grade.

F. Water Motor Alarm: Hydraulically operated impeller type alarm with aluminum alloy chrome-plated gong and motor housing, nylon bearings, and inlet strainer.

G. Electric Alarm: Electrically operated chrome-plated gong with pressure alarm switch.

H. Water Flow Switch: Vane-type switch for mounting horizontally or vertically, with two contacts; rated 10 A at 125 VAC and 2.5 A at 24 VDC.

I. Fire Department Connections:
1. Type: Free standing made of corrosion-resistant metal complying with UL 405.
a. Inlets: Two-way, 2-1/2 inch (65 DN) swivel fittings, internal threaded. Thread size and inlets according to NFPA 1963 or authority having jurisdiction. Brass caps with gaskets, chains, and lugs.
b. Sleeve: Brass, 18-inch (460 mm) height.

2.11 PRESSURE GAUGES

A. Pressure Gauges: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
1. Case: Steel with brass bourdon tube.
2. Diameter: 4-1/2 inch (115 mm).
3. Mid-Scale Accuracy: One percent.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.

B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

C. Install piping to conserve building space, to not interfere with use of space and other work.

D. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Pipe Hangers and Supports:
   1. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
   2. Place hangers within 12 inches (300 mm) of each horizontal elbow.
   3. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
   5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

G. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

H. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.

I. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.

J. Manufactured Sleeve-Seal Systems:
   1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
   2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
   3. Locate piping in center of sleeve or penetration.
   4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
   5. Tighten bolting for a watertight seal.
   6. Install in accordance with manufacturer's recommendations.

K. Escutcheons:
   1. Install and firmly attach escutcheons at piping penetrations into finished spaces.
   2. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.
   3. Use chrome plated escutcheons in occupied spaces and to conceal openings in construction.

L. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.

END OF SECTION

SECTION 21 0500
COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Above ground piping.
B. Buried piping.
C. Escutcheons.
D. Expansions - hose and braid.
E. Mechanical couplings.
F. Pipe hangers and supports.
G. Pipe sleeves.
H. Pipe sleeve-seal systems.
I. Piping specialties.
J. Pressure gauges.

1.02 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.
B. Section 09 9123 - Interior Painting: Preparation and painting of interior fire protection piping systems.
C. Section 21 0553 - Identification for Fire Suppression Piping and Equipment: Piping identification.
D. Section 21 1300 - Fire-Suppression Sprinkler Systems: Sprinkler systems design.

1.03 REFERENCE STANDARDS

A. ASME A112.18.1 - Plumbing Supply Fittings; 2018, with Errata.
B. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2022.
C. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2023.
D. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.
E. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.
F. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2021.
G. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard; 2020.
H. ASME B16.9 - Factory-Made Wrought Buttwelding Fittings; 2018.
I. ASME B16.11 - Forged Fittings, Socket-Welding and Threaded; 2021.
J. ASME B16.25 - Buttwelding Ends; 2022.
K. ASME B36.10M - Welded and Seamless Wrought Steel Pipe; 2022.
L. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).
M. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
N. ASTM A135/A135M - Standard Specification for Electric-Resistance-Welded Steel Pipe; 2021.
O. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2023a.

P. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984, with Editorial Revision (2019).

Q. ASTM A795/A795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use; 2021.

R. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2022).

S. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2018.

T. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2021.

U. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2017.

V. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2017, with Errata (2018).

W. AWWA C606 - Grooved and Shouldered Joints; 2022.

X. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

Y. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems; 2019, with Amendment.

Z. NFPA 1963 - Standard for Fire Hose Connections; 2019.

AA. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Current Edition, Including All Revisions.

BB. UL 405 - Standard for Safety Fire Department Connection Devices; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's catalog information. Indicate valve data and ratings.

C. Shop Drawings: Indicate pipe materials used, jointing methods, supports, and floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

D. Manufacturer's qualification statement.

E. Installer's qualification statement.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section.
   1. Minimum three years experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary protective coating on cast iron and steel valves.

B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Sprinkler-based System:
   1. Comply with NFPA 13.
   2. See Section 21 1300.

B. Combined Sprinkler, Standpipe, and Hose System:
   1. Comply with NFPA 13 and NFPA 14.
   2. See Sections 21 1300 and 21 1200.

C. Welding Materials and Procedures: Comply with ASME BPVC-IX.

D. Provide system pipes, fittings, sleeves, escutcheons, seals, and other related accessories.

2.02 BURIED PIPING

A. Steel Pipe: ASTM A53/A53M Schedule 40, ASTM A135/A135M Schedule 10, ASTM A795/A795M Standard Weight, or ASME B36.10M Schedule 40, black, with AWWA C105/A21.5 polyethylene jacket, or double layer, half-lapped polyethylene tape.
   1. Steel Fittings: ASME B16.9, wrought steel, buttwelded, ASME B16.25, buttweld ends, ASTM A234/A234M, wrought carbon steel or alloy steel, ASME B16.5, steel flanges and fittings, or ASME B16.11, forged steel socket welded and threaded; with double layer, half-lapped polyethylene tape.
   2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings.
   3. Joints: Welded in accordance with AWS D1.1/D1.1M.

B. Ductile Iron Pipe: AWWA C151/A21.51.
   1. Fittings: AWWA C110/A21.10, standard thickness.
   2. Joints: AWWA C111/A21.11, styrene-butadiene rubber (SBR) or vulcanized SBR gasket.
   3. Mechanical Couplings: Shaped composition sealing gasket, steel bolts, nuts, and washers.

2.03 ABOVE GROUND PIPING

A. Steel Pipe: ASTM A795 Schedule 40, black.
   1. Steel Fittings: ASME B16.5 steel flanges and fittings.
   2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.
   3. Malleable Iron Fittings: ASME B16.3, threaded fittings and ASTM A47/A47M.
   4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.
   5. Mechanical Formed Fittings: Carbon steel housing with integral pipe stop and O-ring pocked and O-ring, uniformly compressed into permanent mechanical engagement onto pipe.

2.04 PIPE SLEEVES

A. Vertical Piping:
   1. Sleeve Length: 1 inch (25 mm) above finished floor.
   2. Provide sealant for watertight joint.
   3. Blocked Out Floor Openings: Provide 1-1/2 inch (40 mm) angle set in silicon adhesive around opening.

B. Pipe Passing Through Below Grade Exterior Walls:
   1. Zinc-coated or cast-iron pipe.
   2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.

C. Pipe Passing Through Mechanical and Laundry:
   1. Galvanized steel pipe or black iron pipe with asphalt coating.
   2. Connect sleeve with floor plate except in mechanical rooms.

2.05 PIPE SLEEVE-SEAL SYSTEMS

A. Modular Mechanical Seals:
   1. Elastomer-based interlocking links to continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
   2. Watertight seal between pipe and wall-sleeve, wall or casing opening.
   3. Size and select seal component materials in accordance with service requirements.
   4. Service Requirements:
      a. Underground, buried, and wet conditions.
   5. Glass-reinforced plastic pressure end plates.

B. Wall Sleeve: PVC material with waterstop collar, and nailer end caps.

C. Sleeve-Forming Disk: Nonconductive plastic-based material, 3 inch (76.2 mm) thick.

D. Pipeline-Casing Seals:
   1. End Seals: 1/8 inch (3.1 mm), pull-on type, rubber or synthetic rubber based.

2.06 ESCUTCHEONS

A. Material:
   1. Metals and Finish: Comply with ASME A112.18.1.

B. Construction:
   1. One-piece for mounting on chrome-plated tubing or pipe and one-piece or split-pattern type elsewhere.
   2. Internal spring tension devices or setscrews to maintain a fixed position against a surface.

2.07 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm): Malleable iron, adjustable swivel, split ring.

B. Hangers for Pipe Sizes 2 inches (50 mm) and Over: Carbon steel, adjustable, clevis.

C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

D. Wall Support for Pipe Sizes to 3 inches (80 mm): Cast iron hook.

E. Wall Support for Pipe Sizes 4 inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.

F. Vertical Support: Steel riser clamp.

G. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

2.08 EXPANSION JOINTS AND LOOPS - HOSE AND BRAID

A. Provide flexible loops with two flexible sections of hose and braid, two 90-degree elbows, and 180-degree return with support bracket and air release or drain plug.

B. Flexible Connectors: Flanged, braided type with wetted components of stainless steel, sized to match piping.
   1. Maximum Allowable Working Pressure: 150 psig (1030 kPa) at 120 degrees F (49 degrees C).
   2. Accommodate the Following:
      a. Axial Deflection in Compression and Expansion: _____ inch (_____ mm).
      b. Lateral Movement: _____ inch (_____ mm).
      c. Angular Rotation: 15 degrees.
      d. Force developed by 1.5 times specified maximum allowable operating pressure.
   3. Provide necessary accessories including, but not limited to, swivel joints.

2.09 MECHANICAL COUPLINGS

A. Rigid Mechanical Couplings for Grooved Joints:
   1. Dimensions and Testing: Comply with AWWA C606.
   2. Minimum Working Pressure: 300 psig (2065 kPa).
   3. Housing Material: Fabricate of ductile iron complying with ASTM A536.
   4. Housing Coating: Factory applied orange enamel.
   5. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F (minus 34 degrees C) to 230 degrees F (110 degrees C).
   6. Bolts and Nuts: Hot-dipped-galvanized or zinc-electroplated steel.

2.10 PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber-faced clapper to automatically actuate water motor alarm, pressure retard chamber and variable pressure trim with the following additional capabilities and features:

1. Activate electric alarm.
2. Test and drain valve.
3. Replaceable internal components without removing valve from installed position.

B. Dry Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber-faced clapper to automatically actuate water motor alarm, accelerator, and with the following additional capabilities and features:
1. Activate electric alarm.
2. Test and drain valve.
3. Externally resettable.
4. Replaceable internal components without removing valve from installed position.

C. Auxiliary Drains: Condensate collection drain for each section of trapped pipe in preaction or dry fire protection system.

D. Backflow Preventer: Reduced-pressure principle valve assembly backflow preventer with drain and OS & Y gate valve on each end.

E. Test Connections:
1. Inspector's Test Connection for Preaction and Dry Pipe Systems:
a. Provide test connections approximately 6 feet (2 m) above floor for each or portion of each sprinkler system equipped with an alarm device, located at most remote part of each system.
b. Route test connection to an open-site drain location, excluding janitor sinks, accepting full flow without negative consequences.
c. Supply discharge orifice with same size as corresponding sprinkler orifice.
d. Limit vertical height of exterior wall penetration to 2 feet (0.61 m) above finished grade.

F. Water Motor Alarm: Hydraulically operated impeller type alarm with aluminum alloy chrome-plated gong and motor housing, nylon bearings, and inlet strainer.

G. Electric Alarm: Electrically operated chrome-plated gong with pressure alarm switch.

H. Water Flow Switch: Vane-type switch for mounting horizontally or vertically, with two contacts; rated 10 A at 125 VAC and 2.5 A at 24 VDC.

I. Fire Department Connections:
1. Type: Free standing made of corrosion-resistant metal complying with UL 405.
a. Inlets: Two-way, 2-1/2 inch (65 DN) swivel fittings, internal threaded. Thread size and inlets according to NFPA 1963 or authority having jurisdiction. Brass caps with gaskets, chains, and lugs.
b. Sleeve: Brass, 18-inch (460 mm) height.

2.11 PRESSURE GAUGES

A. Pressure Gauges: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
1. Case: Steel with brass bourdon tube.
2. Diameter: 4-1/2 inch (115 mm).
3. Mid-Scale Accuracy: One percent.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.

B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

C. Install piping to conserve building space, to not interfere with use of space and other work.

D. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Pipe Hangers and Supports:
   1. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
   2. Place hangers within 12 inches (300 mm) of each horizontal elbow.
   3. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
   5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

G. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

H. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.

I. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.

J. Manufactured Sleeve-Seal Systems:
   1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
   2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
   3. Locate piping in center of sleeve or penetration.
   4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
   5. Tighten bolting for a watertight seal.
   6. Install in accordance with manufacturer's recommendations.

K. Escutcheons:
   1. Install and firmly attach escutcheons at piping penetrations into finished spaces.
   2. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.
   3. Use chrome plated escutcheons in occupied spaces and to conceal openings in construction.

L. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.

END OF SECTION

SECTION 21 0523
GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Two-piece ball valves with indicators.

B. Bronze butterfly valves with indicators.

C. Iron butterfly valves with indicators.

D. Check valves.

E. Bronze OS&Y gate valves.

F. Iron OS&Y gate valves.

G. NRS gate valves.

H. Indicator posts.

I. Trim and drain valves.

1.02 RELATED REQUIREMENTS

A. Section 21 0553 - Identification for Fire Suppression Piping and Equipment.

1.03 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide; Current Edition.

B. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Protect internal parts against rust and corrosion.
   2. Set valves open to minimize exposure of functional surfaces.

B. Use the following precautions during storage:
   1. Maintain valve end protection and protect flanges and specialties from dirt.
      a. Provide temporary inlet and outlet caps.
      b. Maintain caps in place until installation.
   2. Store valves in shipping containers and maintain in place until installation.
      a. Store valves indoors and maintain at higher than ambient dew point temperature.
      b. If outdoor storage is unavoidable, store valves off the ground in watertight enclosures.

C. Use the following precautions for handling:
   1. Do not use operating handles or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. UL Listed: Provide valves listed in UL (DIR) under following headings and bearing UL mark:
   1. Main Level: HAMV - Fire Main Equipment.
      a. Level 1: HCBZ - Indicator Posts, Gate Valve.
      b. Level 1: HLOT - Valves.
      c. Level 3: HLUG - Ball Valves, System Control.
      d. Level 3: HLXS - Butterfly Valves.

e. Level 3: HMER - Check Valves.
f. Level 3: HMRZ - Gate Valves.
2. Main Level: VDGT - Sprinkler System & Water Spray System Devices.
a. Level 1: VQGU - Valves, Trim, and Drain.

B. FM Global Approved: Provide valves listed in FM (AG) Approval Guide under the following headings:
1. Automated Sprinkler Systems:
a. Indicator posts.

C. Comply with NFPA 13 for valves.

D. Valve Pressure Ratings: Not less than minimum pressure rating indicated or higher as required.

E. Valve Sizes: Same as upstream piping unless otherwise indicated.

2.02 TWO-PIECE BALL VALVES WITH INDICATORS

A. Description:
1. Minimum Pressure Rating: 175 psig (1200 kPa).
2. Body Design: Two piece.
3. Body Material: Forged brass or bronze.
4. Port Size: Full or standard.
5. Seat: PTFE.
6. Stem: Bronze or stainless steel.
7. Ball: Chrome-plated brass.
8. Actuator: Worm gear or traveling nut.

2.03 BRONZE BUTTERFLY VALVES WITH INDICATORS

A. Minimum Pressure Rating: 175 psig (1200 kPa).

B. Body Material: Bronze.

C. Seat: EPDM.

D. Stem: Bronze or stainless steel.

E. Disc: Bronze with EPDM coating.

F. Actuator: Worm gear or traveling nut.

G. Supervisory Switch: Internal or external.

2.04 IRON BUTTERFLY VALVES WITH INDICATORS

A. Minimum Pressure Rating: 175 psig (1200 kPa).

B. Body Material: Cast or ductile iron with nylon, EPDM, epoxy, polyamide, or _____ coating.

C. Seat: EPDM.

D. Stem: Stainless steel.

E. Disc: Ductile iron, nickel plated.

F. Actuator: Worm gear or traveling nut.

G. Supervisory Switch: Internal or external.

H. Body Design: Grooved-end connections.

2.05 CHECK VALVES

A. Minimum Pressure Rating: 175 psig (1200 kPa).

B. Type: Center guided check valve.

C. Body Material: Cast iron, ductile iron.

D. Center guided check with elastomeric seal.

E. Hinge Spring: Stainless steel.

F. End Connections: Flanged, grooved, or threaded.

2.06 BRONZE OS&Y GATE VALVES

A. Minimum Pressure Rating: 175 psig (1200 kPa).

B. Body and Bonnet Material: Bronze or brass.

C. Wedge: One-piece bronze or brass.

D. Wedge Seat: Bronze.

E. Stem: Bronze or brass.

F. Packing: Non-asbestos PTFE.

G. Supervisory Switch: External.

H. End Connections: Threaded.

2.07 IRON OS&Y GATE VALVES

A. Maximum Working Pressure: 175 psi (1,200 kPa).

B. Body and Bonnet Material: Cast or ductile iron.

C. Wedge: Cast or ductile iron, or bronze with elastomeric coating.

D. Stem: Brass, bronze, or stainless steel.

E. Packing: Non-asbestos PTFE.

F. Supervisory Switch: External.

2.08 INDICATOR POSTS

A. Type: Underground.

B. Base Barrel Material: Cast or ductile iron.

C. Cap: Cast or ductile iron.

D. Operation: Wrench.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Confirm valve interior to be free of foreign matter and corrosion.

B. Remove packing materials.

C. Examine guides and seats by operating valves from the fully open position to the fully closed position.

D. Examine valve threads and mating pipe for form and cleanliness.

3.02 INSTALLATION

A. Comply with specific valve installation requirements and application in the following Sections:

B. Install listed fire protection shutoff valves supervised-open, located to control sources of water supply except from fire department connections.

C. Valves in horizontal piping installed with stem at or above the pipe center.

D. Position valves to allow full stem movement.

E. Install valve tags. Comply with Section 21 0553 requirements for valve tags, schedules, and signs on surfaces concealing valves; and the appropriate NFPA standard applying to the piping system in which valves are installed.

END OF SECTION

SECTION 21 0548
VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Seismic control requirements.

B. Seismic restraint systems

1.02 RELATED REQUIREMENTS

A. Section 01 4533 - Code-Required Special Inspections and Procedures.

1.03 DEFINITIONS

A. Fire Suppression Component: Where referenced in this section in regards to seismic controls, applies to any portion of the fire suppression system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., piping).

B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

1.04 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASCE 19 - Structural Applications of Steel Cables for Buildings; 2016.

C. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.

D. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment; 2014.

E. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.

F. FEMA 414 - Installing Seismic Restraints for Duct and Pipe; 2004.

G. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.

H. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.

C. Shop Drawings - Seismic Controls:
   1. Include dimensioned plan views and sections indicating proposed fire suppression component locations and distributed system routing, with locations and details of gravity supports and seismic restraints and associated attachments.
   2. Identify anchor manufacturer, type, minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
   3. Indicate proposed arrangement of distributed system trapeze support groupings.
   4. Indicate proposed locations for distributed system flexible fittings and/or connections.
   5. Indicate locations of seismic separations where applicable.

D. Seismic Design Data:

1. Compile information on project-specific characteristics of actual installed fire suppression components necessary for determining seismic design forces required to design appropriate seismic controls.

1.06 QUALITY ASSURANCE

A. Comply with applicable building code applicable building code.

B. Seismic Controls Designer Qualifications: Registered professional engineer licensed in the State in which the Project is located and with minimum five five years experience designing seismic restraints for nonstructural components.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 SEISMIC CONTROL REQUIREMENTS

A. Design and provide Design and provide fire suppression component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor fire suppression components.

B. Seismic Design Criteria: ICC (IBC) ICC (IBC).

C. Component Importance Factor (Ip): Fire suppression components to be assigned a component importance factor (Ip) of 1.5 unless otherwise indicated.

D. Seismic Restraints:
   1. Provide seismic restraints for fire suppression components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
   2. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:
      a. ASHRAE (HVACA).
      b. FEMA 412.
      c. FEMA 413.
      d. FEMA 414.
      e. FEMA E-74.
      f. SMACNA (SRM).
   3. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third-party registered professional engineer acceptable to authorities having jurisdiction.
   4. Seismic Restraint Systems:
      a. Arrange restraint elements to avoid obstruction of sprinklers in accordance with NFPA 13.
      b. Except where otherwise restricted, use of either cable or rigid restraints is permitted.
      c. Use only cable restraints to restrain vibration-isolated fire suppression components.
      d. Use only one restraint system type for a given fire suppression component or distributed system (e.g., piping) run; mixing of cable and rigid restraints on a given component/run is not permitted.
      e. Size restraint elements, including anchorage, to resist seismic loads as necessary to restrain fire suppression component in all lateral directions; consider bracket geometry in anchor load calculations.
      f. Use rod stiffener clips to attach bracing to hanger rods as required to prevent rod buckling from vertical (upward) compressive load introduced by cable or rigid restraints loaded in tension, in excess of downward tensile load due to supported fire suppression component weight.
      g. Select hanger rods and associated anchorage as required to accommodate vertical (downward) tensile load introduced by rigid restraints loaded in compression, in

addition to downward tensile load due to supported fire suppression component weight.

h. Clevis hangers may only be used for attachment of transverse restraints; do not use for attachment of longitudinal restraints.
i. Where seismic restraints are attached to clevis hangers, provide clevis bolt reinforcement accessory to prevent clevis hanger deformation.
j. Do not introduce lateral loads on open bar joist chords or the weak axis of beams, or loads in any direction at other than panel points unless approved by project Structural Engineer of Record.

E. Seismic Attachments:
1. Comply with support and attachment requirements of NFPA 13.
2. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
3. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES), ICC Evaluation Service, LLC (ICC-ES), qualified evaluation service acceptable to authorities having jurisdiction, or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
4. Do not use power-actuated fasteners except where permitted by applicable code except where permitted by applicable code.
5. Do not use friction clips (devices that rely on mechanically applied friction to resist loads) except where permitted by applicable code except where permitted by applicable code. Beam clamps may be used for supporting sustained loads where provided with restraining straps, but not for sway bracing attachments as prohibited by NFPA 13.
6. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
7. Concrete Housekeeping Pads:
a. Increase size of pad as required to comply with anchor requirements.
b. Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.

F. Seismic Interactions:
1. Include provisions to prevent seismic impact between fire suppression components and other structural or nonstructural components.
2. Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.
3. Comply with minimum clearance requirements between other equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs.

G. Seismic Relative Displacement Provisions:
1. Use suitable fittings or flexible connections, in accordance with NFPA 13, to accommodate:
a. Relative displacements at connections between components, including distributed systems (e.g., piping); do not exceed load limits for equipment utility connections.
b. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
c. Design displacements at seismic separations.
d. Anticipated drifts between floors.
2. Provide clearance around fire suppression system piping extending through walls, floors, platforms, and foundations in accordance with NFPA 13.

2.02 SEISMIC RESTRAINT SYSTEMS

A. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

B. Where required by NFPA 13, provide products listed as complying with UL 203A, UL 203A, FM 1950, or FM 1950.

C. Cable Restraints:
   1. Comply with ASCE 19.
   2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
   3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
   4. Use protective thimbles for cable loops where potential for cable damage exists where potential for cable damage exists.

D. Rigid Restraints: Use MFMA-4 steel channel (strut), MFMA-4 steel channel (strut), steel angle, steel angle, steel pipe, or steel pipe for structural element; suitable for both compressive and tensile design loads.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 CODE-REQUIRED SPECIAL INSPECTIONS

A. Arrange work to accommodate tests and/or inspections performed by Special Inspection Agency employed by Owner or Architect in accordance with Section 01 45 33 and statement of special inspections as required by applicable building code.

B. Frequency of Special Inspections: Where special inspections are designated as continuous or periodic, arrange work accordingly.
   1. Continuous Special Inspections: Special Inspection Agency to be present in the area where the work is being performed and observe the work at all times the work is in progress.
   2. Periodic Special Inspections: Special Inspection Agency to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.

C. Prior to starting work, Contractor to submit written statement of responsibility to authorities having jurisdiction and to Owner acknowledging awareness of special requirements contained in the statement of special inspections.

D. Special Inspection Agency services do not relieve Contractor from performing inspections and testing specified elsewhere.

3.03 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Secure fasteners according to manufacturer's recommended torque settings.

D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

E. Seismic Controls:
   1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris, or other obstructions.
   2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.

3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch (3 mm), use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch (3 mm) or less.
4. Equipment with Sheet Metal Housings:
   a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
   b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
   c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
5. Concrete Housekeeping Pads:
   a. Size in accordance with seismic design to meet anchor requirements.
   b. Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.
6. Seismic Restraint Systems:
   a. Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.
   b. Install restraints within permissible angles in accordance with seismic design.
   c. Install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.
   d. Install cable restraints for vibration-isolated components slightly slack to prevent short-circuiting of isolation.
   e. Install hanger rod stiffeners where indicated using only specified clamps; do not weld stiffeners to hanger rod.

END OF SECTION

SECTION 21 1100
FACILITY FIRE-SUPPRESSION WATER-SERVICE PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Water pipe.

B. Valves.

C. Fire department connections.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

B. Section 31 2316 - Excavation.

C. Section 31 2316.13 - Trenching.

D. Section 31 2323 - Fill.

1.03 REFERENCE STANDARDS

A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.

B. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2021.

C. ASSE 1060 - Performance Requirements for Outdoor Enclosures for Fluid Conveying Components; 2017 (Reaffirmed 2021).

D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

E. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2022a.

F. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2021a.

G. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2021.

H. ASTM D2855 - Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2020.

I. AWWA C104/A21.4 - Cement-Mortar Lining for Ductile Iron Pipe and Fittings; 2022.

J. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2018.

K. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2021.

L. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2017.

M. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2017, with Errata (2018).

N. AWWA C206 - Field Welding of Steel Water Pipe; 2017.

O. AWWA C600 - Installation of Ductile-Iron Mains and Their Appurtenances; 2017.

P. AWWA C605 - Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings; 2021.

Q. AWWA M11 - Steel Pipe - A Guide for Design and Installation; 2016, with Addendum (2019).

R. AWWA M23 - PVC Pipe—Design and Installation; 2020.

S. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

T. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data:
   1. Include data on pipe materials, pipe fittings, valves, and accessories.
   2. Provide manufacturer's catalog information.

C. Project Record Documents:
   1. Record actual locations of piping mains, valves, connections, fire hydrants, free-standing fire department connections, underground manholes and vaults, valve boxes, thrust restraints, and invert elevations.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 - PRODUCTS

2.01 WATER PIPE

A. Steel Pipe: Standard weight, zinc-coated, listed, ASTM A53/A53M.
   1. Fittings: Comply with ASME B16.3 Class 150, zinc-coated, threaded or ASME B16.4 Class 125, zinc-coated.
   2. Mechanically Factory Applied Protective Materials:
      a. Clean by wire brushing and solvent cleaning.
      b. Apply one coat of coal-tar primer and two coats of coal-tar enamel complying with AWWA C203.
      c. Protect threaded pipe ends and fittings prior to coating.

B. Ductile Iron Pipe: Listed, AWWA C104/A21.4:
   1. Fittings: Ductile iron, standard thickness.
   2. Joints: AWWA C111/A21.11, styrene-butadiene rubber (SBR) or vulcanized SBR gasket with rods.
   3. Jackets: AWWA C105/A21.5 polyethylene jacket.

C. Ductile Iron Pipe: Listed, AWWA C151/A21.51.
   1. Fittings: AWWA C110/A21.10, ductile iron, standard thickness.
   2. Joints: AWWA C111/A21.11, styrene-butadiene rubber (SBR) or vulcanized SBR rubber gasket with 3/4 inch (19 mm) diameter rods.

D. PVC Pipe: Listed, ASTM D1785 Schedule 40.
   1. Fittings: ASTM D2466, PVC.
   2. Joints: ASTM D2855, solvent weld.

2.02 VALVES

A. General:
   1. Manufacturer's name and pressure rating marked on valve body.
   2. Minimum Compliance: UL (DIR) listed and labeled.
   3. Maximum Inlet Pressure: 400 psi (2,760 kPa).
   4. Maximum Service Temperature: 180 degrees F (82.2 degrees C).
   5. Valve Coatings:
      a. Internally: 4 mils, 0.004 inch (0.10 mm) epoxy, minimum.
      b. Externally: Epoxy base then fire red enamel paint or heat-fused red epoxy paint.

2.03 ACCESSORIES

A. Concrete for Thrust Restraints: Concrete type specified in Section 03 3000.

B. Outdoor Backflow Enclosures:
   1. Insulated Enclosure with Heat Source for Freeze Protection:

a. Description: Enclosure for protection of above-ground piping, specialties, and equipment from vandalism, damage, weather, and freezing.
b. Comply with ASSE 1060, Class I.
c. Construction:
1) Building Envelope: Insulated, reinforced fiberglass or aluminum.
2) Dimensions: As indicated.
3) Access doors with locking devices.
4) Anchors for attaching enclosure to concrete base.
d. Heating System:
1) Provide electric heat tracing or electric space heater including temperature controls.
2) Electric Heat Tracing: Provide capacity to maintain water temperature at or above 40 degrees F (4 degrees C) when the outdoor design temperature is _____ degrees F (_____ degrees C).
3) Electric Space Heater: Provide capacity to maintain internal space temperature at or above 40 degrees F (4 degrees C) when the outdoor design temperature is _____ degrees F (_____ degrees C).

C. Tracer Wire:
1. Provide magnetic, detectable conductor with clear plastic covering and imprinted with "Water Service" in large letters.
2. Conductor to be of sufficient length to be continuous over each separate run of nonmetallic pipe.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that building service connection and municipal utility water main size, location, and invert are as indicated.

3.02 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with flanges or unions.

3.03 TRENCHING

A. Earthwork: Perform earthwork operations in accordance with Sections 31 2316, 31 2316.13, and 31 2323.

B. Hand trim excavation for accurate placement of pipe to elevations indicated.

C. Form and place concrete for pipe thrust restraints at each change of pipe direction. Place concrete to permit full access to pipe and pipe accessories. Provide ____ sq feet (____ sq m) thrust restraint bearing on subsoil.

D. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.04 INSTALLATION

A. General Requirements:
1. Location of Water Lines:
a. Terminate the work covered by this Section at a point approximately 5 feet (1.5 m) from the building unless indicated otherwise.
b. Do not install water line closer horizontally than 10 feet (3 m) from any sewer line unless indicated otherwise.
c. Water Piping Parallel With Sewer Piping:
1) Install water piping minimum 10 feet (3 m) horizontally (measured edge-to-edge) from a sewer or sewer manhole where possible.
2) Bottom (Invert) of Water Piping:

(a) Minimum 18 inches (450 mm) above top (crown) of sewer piping.
(b) Where this vertical separation of 18 inches (450 mm) above top (crown) of sewer piping cannot be obtained, the installation will be acceptable only when sewer piping is constructed of AWWA approved water pipe and pressure tested in place without leakage prior to backfilling.

d. Water Piping Crossing Sewer Piping:
1) Crossing Under:
(a) Where water lines cross under gravity sewer lines, encase sewer line fully in concrete for a distance of at least 10 feet (3 m) on each side of the crossing, unless sewer line is made of pressure pipe with rubber gasketed joints and no joint is located within 3 feet (900 mm) horizontally of the crossing.
2) Crossing Over:
(a) Install water lines which cross over sewer force mains and inverted siphons at least 2 feet (600 mm) above these sewer lines; when joints in the sewer line are within 3 feet (900 mm) horizontally from the water line, encase joints in concrete.
(b) Provide a separation of at least 18 inches (450 mm) between the bottom of the water piping and the top of the sewer piping.

2. Sleeving:
a. Sleeve water piping where piping is required to be installed within 3 feet (900 mm) of existing structures.
b. Provide ductile iron or Schedule 40 steel sleeves.
c. Fill annular space between pipe and sleeves with mastic.
d. Install water pipe and sleeve without damaging structures or causing settlement or movement of foundations or footings.

3. Pipe Laying and Jointing:
a. Remove fins and burrs from pipe and fittings.
b. Prior to placing in position, clean pipe, fittings, valves, and accessories, and maintain in clean condition.
c. Provide proper facilities for lowering pipe sections into trenches.
d. Dropping or dumping of piping, fittings, valves, or any other water line material into trenches is not permitted.
e. Cut pipe in a neat, workmanlike manner accurately to length established at the site and work into place without forcing or springing.
f. Replace by one of the proper length any pipe or fitting that does not allow sufficient space for proper installation of jointing material.
g. Wedging or blocking between bells and spigots will not be permitted.
h. Install bell-and-spigot pipe with the bell end pointing in the direction of laying.
i. Grade the pipeline in straight lines avoiding the formation of dips and low points.
j. Support piping at proper elevation and grade.
k. Secure firm, uniform support.
l. Wood support blocking will not be permitted.
m. Install pipe so that the full length of each pipe section and each fitting will rest solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings.
n. Provide anchors and supports where indicated and necessary for fastening work into place.
o. Provide proper provisions for expansion and contraction of pipelines.
p. Keep trenches free of water until joints have been properly made.
q. Close open ends of piping temporarily with wood blocks or bulkheads at the end of each workday.
r. Do not install pipe during unacceptable trench conditions or inclement weather.
s. Minimum Depth of Pipe Cover: Not less than 2-1/2 feet (760 mm).

4. Connections to Existing Water Lines:
a. Ensure minimal interruption of service on the existing line.

b. Make connections to existing lines under pressure in accordance with the recommended procedures of the manufacturer of the pipe being tapped.

5. Penetrations:
   a. Provide ductile-iron or Schedule 40 steel for pipes passing through walls of valve pits and structures.
   b. Fill annular space between sleeves and walls with rich cement mortar.
   c. Fill annular space between pipe and sleeves with mastic.

B. Special Requirements:
1. Ductile Iron Piping:
   a. Unless otherwise specified, install pipe and fittings in accordance with paragraph "General Requirements".
   b. Jointing:
      1) Make push-on joints with the gaskets and lubricant specified for this type joint; assemble in accordance with the applicable requirements of AWWA C600 for joint assembly.
      2) Make mechanical joints with the gaskets, glands, bolts, and nuts specified for this type joint; assemble in accordance with the applicable requirements of AWWA C600 for joint assembly and the recommendations of Appendix A to AWWA C111/A21.11.
   c. Allowable Deflection:
      1) Maximum Allowable Deflection: As stated in AWWA C600.
      2) If the alignment requires deflection in excess of the above limitations, furnish special blends or a sufficient number of shorter pipe lengths to provide angular deflections within the limit set forth.
   d. Pipe Anchorage:
      1) Provide concrete thrust blocks (reaction backing), for pipe anchorage except where metal harness is indicated.
      2) Thrust blocks to comply with the requirements of AWWA C600 for thrust restraint, except that size and positioning of thrust blocks to be as indicated.
      3) Use concrete, ASTM C94/C94M, having a minimum compressive strength of 2,500 psi (15 MPa) at 28 days; or use concrete of a mix not leaner than one part cement, 2-1/2 parts sand, and 5 parts gravel, having the same minimum compressive strength.
      4) Provide metal harness in accordance with the requirements of AWWA C600 for thrust restraint, using tie rods and clamps as indicated in NFPA 13, except as otherwise indicated.
   e. Exterior Protection: Completely encase buried ductile iron pipelines with polyethylene tube or sheet, using Class A polyethylene film, in accordance with AWWA C105/A21.5.
2. PVC Plastic Piping:
   a. Unless otherwise specified, install pipe and fittings in accordance with paragraph "General Requirements"; with the requirements of AWWA C605 for laying of pipe, joining PVC pipe to fittings and accessories, and setting of hydrants, valves, and fittings; and with the recommendations for pipe joint assembly and appurtenance installation in AWWA M23.
   b. Jointing:
      1) Push-On Joints:
         (a) Make push-on joints with the elastomeric gaskets specified for this type joint, using either elastomeric-gasket bell-end pipe or elastomeric-gasket couplings.
         (b) For pipe-to-pipe push-on joint connections, use only pipe with push-on joint ends having factory-made bevel.
         (c) For push-on joint connections to metal fittings, valves, and other accessories, cut spigot end of pipe off square and re-bevel pipe end to a bevel approximately the same as that on ductile-iron pipe used for the

same type of joint.
(d) Use an approved lubricant recommended by the pipe manufacturer for push-on joints.
(e) Assemble push-on joints for pipe-to-pipe joint connections in accordance with the requirements of AWWA C605 for laying the pipe and the recommendations in AWWA M23 for pipe joint assembly.
(f) Assemble push-on joints for connection to fittings, valves, and other accessories in accordance with the requirements of AWWA C605 for joining PVC pipe to fittings and accessories and with the applicable requirements of AWWA C600 for joint assembly.

c. Offset: Maximum offset in alignment between adjacent pipe joints to be as recommended by the manufacturer and approved by the Architect, not to exceed 5 degrees.
d. Pipe Anchorage:
1) Provide concrete thrust blocks (reaction backing) for pipe anchorage, except where metal harness is indicated.
2) Provide thrust blocks in accordance with the requirements of AWWA C605 for reaction or thrust blocking and plugging of dead ends, except that size and positioning of thrust blocks to be as indicated.
3) Use concrete, ASTM C94/C94M, having a minimum compressive strength of 2,500 psi (15 MPa) at 28 days; or use concrete of a mix not leaner than one part cement, 2-1/2 parts sand, and 5 parts gravel, having the same minimum compressive strength.
4) Provide metal harness as indicated.
e. Fittings: Install in accordance with AWWA C605.

3. Steel Piping:
a. Jointing:
1) Bell-and-Spigot: Make rubber-gasketed, bell-and-spigot joints with the gaskets previously specified for this type of joint, using an approved lubricant, all in accordance with the pipe manufacturer's recommendations.
2) Welded: Make welded joints in accordance with AWWA C206 and install in accordance with AWWA M11.
b. Allowable Offsets:
1) Form short-radius curves and closures by short lengths of pipe or fabricated specials specified.
c. Pipe Anchorage:
1) Provide concrete thrust blocks (reaction backing) for pipe anchorage, except where metal harness is indicated.
2) Thrust blocks to be in accordance with the recommendations for thrust restraint in AWWA M11, except that size and positioning of thrust blocks are to be as indicated.
3) Use ASTM C94/C94M concrete having a minimum compressive strength of 2500 psi (15 MPa) at 28 days; or use concrete of a mix not leaner than one part cement, 2-1/2 parts sand, and 5 parts gravel, having the same minimum compressive strength.
4) Metal Harness:
(a) Provide in accordance with the recommendations for joint harnesses in AWWA M11, except as otherwise indicated.
(b) Fabricated by the pipe manufacturer and furnished with the pipe.

C. Valves:
1. Set valves on solid bearing.
2. Center and plumb valve box over valve.
3. Set box cover flush with finished grade.

3.05 SERVICE CONNECTIONS

A. Provide fire water service to Local Authority Having Jurisdiction requirements with reduced pressure backflow preventer and water meter with by-pass valves.

B. Provide sleeve in retaining wall for service main. Support with reinforced concrete bridge. Caulk enlarged sleeve watertight.

3.06 FIELD QUALITY CONTROL

A. Field Tests and Inspections:
   1. See Section 01 4000 - Quality Requirements for additional requirements.
   2. Provide all labor, equipment, and incidentals required for field testing, except that water and electric power needed for field tests will be furnished as set forth in Section 01 5100 - Temporary Utilities.
   3. Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently and at least 5 days after placing of concrete.
   4. Fill pipeline 24 hours before testing and apply test pressure to stabilize system, using only potable water.
   5. Pressure test piping.
   6. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.
   7. Prepare reports of testing activities.

3.07 CLOSEOUT ACTIVITIES

A. Training: Train Owner's personnel on operation and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

END OF SECTION

SECTION 21 1200
FIRE-SUPPRESSION STANDPIPES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hose reels and hoses.

B. Valves.

1.02 RELATED REQUIREMENTS

A. Section 21 0500 - Common Work Results for Fire Suppression: Fire protection piping.

B. Section 21 0523 - General-Duty Valves for Water-Based Fire-Suppression Piping.

C. Section 21 0553 - Identification for Fire Suppression Piping and Equipment.

D. Section 21 1300 - Fire-Suppression Sprinkler Systems.

E. Section 21 3000 - Fire Pumps.

1.03 REFERENCE STANDARDS

A. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems; 2019, with Amendment.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's catalog sheet for equipment indicating rough-in size, finish, and accessories.

B. Shop Drawings: Indicate supports, components, accessories, and sizes.

C. Project Record Documents: Record actual locations of components.

D. Maintenance Data: Include servicing requirements and test schedule.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with NFPA 14.

PART 2 PRODUCTS

2.01 VALVES

A. General Duty Valves: See Section 21 0523.

B. Specialty Valves:
   1. Hose Connection Valve:
      a. Angle type; brass finish; 2-1/2 inch NPS (65 mm, DN), thread to match fire department hardware, 300 psi (2,070 kPa) working pressure, with threaded cap and chain of same material and finish.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NFPA 14.

C. Connect standpipe system to water source ahead of domestic water connection.

D. Flush entire system of foreign matter.

END OF SECTION

SECTION 21 1300
FIRE-SUPPRESSION SPRINKLER SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Wet-pipe sprinkler system.

B. Dry-pipe sprinkler system.

C. System design, installation, and certification.

D. Fire department connections.

1.02 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide; Current Edition.

B. ITS (DIR) - Directory of Listed Products; Current Edition.

C. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 1963 - Standard for Fire Hose Connections; 2019.

E. UL (DIR) - Online Certifications Directory; Current Edition.

F. UL 405 - Standard for Safety Fire Department Connection Devices; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Shop Drawings:
   1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
   2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components, and accessories. Indicate system controls.
   3. Submit shop drawings to Authorities Having Jurisdiction for approval. Submit proof of approval to Architect.

D. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and code requirements.

E. Designer's qualification statement.

F. Manufacturer's qualification statement.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements for additional provisions.
   2. Extra Sprinklers: Type and size matching those installed in quantity required by referenced NFPA design and installation standard.
   3. Sprinkler Wrenches: For each sprinkler type.

1.04 QUALITY ASSURANCE

A. Comply with UL (DIR) requirements.

B. Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

C. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

PART 2 - PRODUCTS

2.01 SPRINKLER SYSTEM

A. Sprinkler System: Provide coverage for entire building.

B. Occupancy: Light hazard; comply with NFPA 13 unless otherwise noted.

C. Water Supply: Determine volume and pressure from water flow test data.

D. Interface system with building fire and smoke alarm system.

E. Provide fire department connections where indicated.

F. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.

2.02 SPRINKLERS

A. Suspended Ceiling Type: Semi-recessed pendant type with matching push on escutcheon plate.
   1. Response Type: Quick.
   2. Coverage Type: Standard.
   3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

B. Exposed Area Type: Pendant type with guard.
   1. Response Type: Quick.
   2. Coverage Type: Standard.
   3. Finish: Brass.
   4. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

C. Sidewall Type: Semi-recessed horizontal sidewall type with matching push on escutcheon plate.
   1. Response Type: Quick.
   2. Coverage Type: Standard.
   3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

D. Dry Sprinklers: Concealed pendant type with matching push on escutcheon plate.
   1. Response Type: Quick.
   2. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

E. Storage Sprinklers: Pendant type with guard.
   1. Response Type: Standard.
   2. Coverage Type: Standard.
   3. Finish: Chrome plated.
   4. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

F. Flexible Drop System: Stainless steel, multiple use, open gate type.
   1. Application: Use to properly locate sprinkler heads.
   2. Include all supports and bracing.
   3. Provide braided type tube as required for the application.

2.03 PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber-faced clapper to automatically actuate water motor alarm, pressure retard chamber and variable pressure trim with the following additional capabilities and features:
   1. Activate electric alarm.
   2. Test and drain valve.
   3. Replaceable internal components without removing valve from installed position.

B. Dry Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate water motor alarm, accelerator, and with the following additional capabilities and features:
   1. Activate electric alarm.
   2. Test and drain valve.
   3. Externally resettable.

C. Backflow Preventer: Reduced pressure principle valve assembly backflow preventer with drain and OS & Y gate valve on each end.

D. Test Connections:
   1. Backflow Preventer Test Connection:
      a. Provide downstream of the backflow prevention assembly, listed hose valves with 2.5 inch (65 mm) National Standard male hose threads with cap and chain.
      b. Furnish one valve for each 250 gpm (16 L/s) of system demand or fraction thereof.
      c. Provide permanent sign reading "Test Valve" in accordance with Section 21 0553.

E. Water Motor Alarm: Hydraulically operated impeller type alarm with aluminum alloy chrome plated gong and motor housing, nylon bearings, and inlet strainer.

F. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.

G. Fire Department Connections:
   1. Type: Free standing made of corrosion resistant metal complying with UL 405.
      a. Inlets: Two way, 2-1/2 inch (65 DN) swivel fittings, internal threaded. Thread size and inlets according to NFPA 1963 or Authority Having Jurisdiction. Brass caps with gaskets, chains, and lugs.
      b. Sleeve: Brass, 18 inches (460 mm) height.

2.04 AIR COMPRESSOR

A. Compressor: Single-unit, electric motor driven, motor, motor starter, safety valves, check valves, air maintenance device incorporating electric pressure switch and unloader valve.

B. Electrical Characteristics:
   1. 125 volts, single phase, 60 Hz.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with referenced NFPA design and installation standard.

B. Install equipment in accordance with manufacturer's instructions.

C. Provide approved double check valve assembly at sprinkler system water source connection.

D. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent siamese connectors to allow full swing of fire department wrench handle.

E. Place pipe runs to minimize obstruction to other work.

F. Place piping in concealed spaces above finished ceilings.

G. Center sprinklers in two directions in ceiling tile and provide piping offsets as required.

H. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.

I. Install air compressor on vibration isolators. Refer to Section 22 0548.

J. Flush entire piping system of foreign matter.

K. Hydrostatically test entire system.

L. Require test be witnessed by Fire Marshal.

3.02 INTERFACE WITH OTHER PRODUCTS

A. Ensure required devices are installed and connected as required to fire alarm system.

END OF SECTION

SECTION 21 3000
FIRE PUMPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Split-case fire pump.

B. Jockey pump.

1.02 RELATED REQUIREMENTS

A. Section 21 0500 - Common Work Results for Fire Suppression: Fire protection piping.

B. Section 21 0513 - Common Motor Requirements for Fire Suppression Equipment.

C. Section 21 0548 - Vibration and Seismic Controls for Fire Suppression Piping and Equipment.

D. Section 21 0716 - Fire Suppression Equipment Insulation.

E. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

F. Section 28 4600 - Fire Detection and Alarm.

1.03 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide; Current Edition.

B. ITS (DIR) - Directory of Listed Products; Current Edition.

C. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 20 - Standard for the Installation of Stationary Pumps for Fire Protection; 2022.

E. UL 448 - Centrifugal Stationary Pumps for Fire-Protection Service; Current Edition, Including All Revisions.

F. UL 778 - Standard for Motor-Operated Water Pumps; Current Edition, Including All Revisions.

G. UL 1478 - Fire Pump Relief Valves; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate layout, general assembly, components, dimensions, weights, clearances, and methods of assembly.

C. Test Reports: Indicate results of hydrostatic test and field acceptance tests.

D. Project Record Documents: Record actual locations of components and accessories.

1.06 QUALITY ASSURANCE

A. Comply with NFPA 13 and NFPA 20; where requirements differ comply with the most stringent.

B. Provide certificate of compliance from authority have jurisdiction indicating approval of field acceptance tests.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver fire pumps and components in factory packing. Comply with manufacturer's rigging and installation instructions.

B. Protect fire pumps and components from physical damage including effects of weather, water, and construction debris.

C. Provide temporary inlet and outlet caps, and maintain in place until installation.

PART 2 PRODUCTS

2.01 FIRE PUMPS

A. Split-Case Fire Pump:
   1. UL 448 and UL 778; vertical- or horizontal-mounted, single-stage, double-suction centrifugal pump for maximum working pressure of 294 psi (2,027 kPa).
   2. Casing: Cast iron, with suction and discharge gauge ports, renewable bronze casing wearing rings, seal flush connection, drain plug, flanged suction and discharge.
   3. Impeller: Bronze double suction fully enclosed, balanced and keyed to shaft.
   4. Bearings: Grease lubricated ball bearings, replaceable without opening casing.
   5. Shaft: Alloy steel with replaceable bronze shaft sleeve.
   6. Seal: Packing gland with minimum four rings graphite impregnated packing and bronze lantern rings, 230 degrees F (110 degrees C) maximum continuous operating temperature.
   7. Drive: Flexible coupling with coupling guard.
   8. Baseplate: Cast iron or fabricated steel with integral drain rim.

2.02 JOCKEY PUMP

A. Electrically operated, horizontal or vertical, single or multi stage, turbine type centrifugal pump with standard open drip-proof horizontal motor.

B. Control by automatic jockey pump controller with full voltage starter and minimum run timer to start pump on pressure drop in system and stay in operation for minimum period of time. Fire pump shall start automatically on further pressure drop or on jockey pump failure.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with NFPA 20.

B. Provide access space around pumps for service; no less than minimum as recommended by manufacturer.

C. Piping: Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. For base mounted pumps, provide supports under elbows on pump suction and discharge; see Section 21 0500.

D. Provide drains for bases and seals, piped to and discharging into floor drains.

E. Provide for connection to electrical service; see Section 26 0583.

F. Lubricate pumps before start-up.

G. Provide supervisory alarm notifications using auxiliary dry contacts interconnected into fire alarm system for monitoring by Owner-designated central or off-site point of constant attendance; see Section 28 4600.

3.02 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Perform hydrostatic tests, flushing, and field acceptance tests as specified in NFPA 20.

C. Perform field acceptance tests in the presence of Fire Marshal.

3.03 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals for additional submittals.

END OF SECTION

SECTION 22 0513
COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. General construction and requirements.

B. Applications.

C. Single phase electric motors.

D. Three phase electric motors.

1.02 REFERENCE STANDARDS

A. NEMA MG 1 - Motors and Generators; 2021.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.

PART 2 - PRODUCTS

2.01 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Construction:
   1. Open drip-proof type except where specifically noted otherwise.
   2. Design for continuous operation in 104 degrees F (40 degrees C) environment.
   3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.

B. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

C. Wiring Terminations:
   1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
   2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.02 APPLICATIONS

2.03 SINGLE PHASE POWER - SPLIT PHASE MOTORS

A. Starting Torque: Less than 150 percent of full load torque.

B. Starting Current: Up to seven times full load current.

C. Breakdown Torque: Approximately 200 percent of full load torque.

2.04 SINGLE PHASE POWER - PERMANENT-SPLIT CAPACITOR MOTORS

A. Starting Torque: Exceeding one fourth of full load torque.

B. Starting Current: Up to six times full load current.

C. Multiple Speed: Through tapped windings.

2.05 SINGLE PHASE POWER - CAPACITOR START MOTORS

A. Starting Torque: Three times full load torque.

B. Starting Current: Less than five times full load current.

C. Pull-up Torque: Up to 350 percent of full load torque.

2.06 THREE PHASE POWER - SQUIRREL CAGE MOTORS

A. Starting Torque: Between 1 and 1-1/2 times full load torque.

B. Starting Current: Six times full load current.

C. Power Output, Locked Rotor Torque, Breakdown or Pull Out Torque: NEMA Design B characteristics.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

END OF SECTION

SECTION 22 0517
SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Pipe sleeves.

B. Pipe sleeve-seals.

1.02 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

PART 2 - PRODUCTS

2.01 PIPE SLEEVES

A. Vertical Piping:
   1. Sleeve Length: 1 inch (25 mm) above finished floor.
   2. Provide sealant for watertight joint.

B. Clearances:
   1. Provide allowance for insulated piping.
   2. Wall, Floor, Partitions, and Beam Flanges: 1 inch (25 mm) greater than external pipe diameter.
   3. All Rated Openings: Caulked tight with fire stopping material complying with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.

2.02 PIPE-SLEEVE SEALS

A. Modular Mechanical Sleeve-Seal:
   1. Elastomer-based interlocking links continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
   2. Watertight seal between pipe and wall-sleeve, wall or casing opening.
   3. Size and select seal component materials in accordance with service requirements.
   4. Glass-reinforced plastic pressure end plates.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

B. Install piping to conserve building space, to not interfere with use of space and other work.

C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

D. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.

E. Manufactured Sleeve-Seal Systems:
   1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
   2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
   3. Locate piping in center of sleeve or penetration.
   4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
   5. Tighten bolting for a water-tight seal.
   6. Install in accordance with manufacturer's recommendations.

F. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

END OF SECTION

SECTION 22 0529
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Prefabricated trapeze-framed systems.

B. Strut systems for pipe or equipment support.

C. Beam clamps.

D. Pipe hangers.

E. Pipe rollers and roller supports.

F. Pipe supports, guides, shields, and saddles.

G. Anchors and fasteners.

1.02 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping; 2023.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).

F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.

G. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).

H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

J. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

K. FM (AG) - FM Approval Guide; Current Edition.

L. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

M. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Provide required hardware to hang or support piping, equipment, or fixtures with related accessories as necessary to complete installation of plumbing work.

B. Provide hardware products listed, classified, and labeled as suitable for intended purpose.

C. Materials for Metal Fabricated Supports: Comply with Section 05 5000.
   1. Zinc-Plated Steel: Electroplated in accordance with ASTM B633 unless stated otherwise.
   2. Galvanized Steel: Hot-dip galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M unless stated otherwise.

D. Corrosion Resistance: Use corrosion-resistant metal-based materials fully compatible with exposed piping materials and suitable for the environment where installed.

2.02 PREFABRICATED TRAPEZE-FRAMED SYSTEMS

A. Prefabricated Trapeze-Framed Metal Strut Systems:
   1. Strut Channel or Bracket Material:
      a. Indoor Dry Locations: Use zinc-plated steel or galvanized steel.
      b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
   2. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch (2.66 mm).
   3. Minimum Channel Dimensions: 1-5/8 inch (41 mm) width by 13/16 inch (21 mm) height.
   4. Accessories: Provide bracket covers, cable basket clips, cable tray clips, clamps, conduit clamps, fire-retarding brackets, j-hooks, protectors, and vibration dampeners.

2.03 STRUT SYSTEMS FOR PIPE OR EQUIPMENT SUPPORT

A. Strut Channels:
   1. ASTM A653/A653M galvanized steel bracket with clamps for surface mounting of piping or plumbing equipment support.
   2. Channel or Bracket Kits: Include rods, brackets, end-fixed fittings, covers, clips, and other related hardware required to complete sectional trapeze section for piping or other support.

B. Hanger Rods:
   1. Threaded zinc-plated steel unless otherwise indicated.

C. Channel Nuts:
   1. Provide carbon steel channel nut with epoxy copper or zinc finish and long, regular, or short spring as indicated on drawings.

D. Cable Hanging System Kits:
   1. Provide cable-wire in bulk or pre-cut lengths with respective cable hangers as required to hold minimum weight of 120 lb (54.4 kg).

2.04 BEAM CLAMPS

A. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.

B. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

2.05 PIPE HANGERS

A. Band Hangers, Adjustable:
   1. MSS SP-58 type 7 or 9, zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.

B. J-Hangers, Adjustable:
   1. MSS SP-58 type 5, zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.

C. Swivel Ring Hangers, Adjustable:
   1. MSS SP-58 type 10, epoxy-painted, zinc-colored.

2. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
3. FM (AG) and UL (DIR) listed for specific pipe size runs and loads.

D. Clevis Hangers, Adjustable:
1. Copper Tube: MSS SP-58 type 1, epoxy-plated copper.
2. Felt-Lined: MSS SP-58 type 1, zinc-plated, silicone-free carbon steel.
3. Light-Duty: MSS SP-58 type 1, zinc-colored, epoxy plated.
4. Standard-Duty: MSS SP-58 type 1, zinc-colored, epoxy plated.

2.06 PIPE CLAMPS

A. Riser Clamps:
1. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.
2. MSS SP-58 type 1 or 8, carbon steel or steel with epoxy plated, plain, stainless steel, or zinc plated finish.
3. UL (DIR) listed: Pipe sizes 1/2 to 8 inch (15 to 200 mm, DN).

2.07 PIPE ROLLERS AND ROLLER SUPPORTS

A. MSS SP-58 type 43 based on required load, nonconductive and corrosion resistant.

B. Material: Zinc plated ASTM A36/A36M carbon steel or ASTM A47/A47M malleable iron.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

F. Equipment Support and Attachment:
1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

G. Secure fasteners according to manufacturer's recommended torque settings.

H. Remove temporary supports.

END OF SECTION

SECTION 22 0548
VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Seismic control requirements.
   1. Includes requirements for seismic qualification of equipment not specified in this section.

B. Seismic restraint systems.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

1.03 DEFINITIONS

A. Plumbing Component: Where referenced in this section in regards to seismic controls, applies to any portion of the plumbing system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., piping).

B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

1.04 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment; 2014.

C. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.

D. FEMA 414 - Installing Seismic Restraints for Duct and Pipe; 2004.

E. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.

F. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Seismic Controls:
      a. Coordinate the arrangement of seismic restraints with piping, conduit, equipment, and other potential conflicts installed under other sections or by others.
      b. Coordinate the work with other trades to accommodate relative positioning of essential and nonessential components in consideration of seismic interaction.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 3000.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
   1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.
   2. Seismic Controls: Include seismic load capacities.

D. Shop Drawings - Seismic Controls:
   1. Include dimensioned plan views and sections indicating proposed plumbing component locations and distributed system routing, with locations and details of gravity supports and seismic restraints and associated attachments.
   2. Identify mounting conditions required for equipment seismic qualification.
   3. Identify anchor manufacturer, type, minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
   4. Indicate proposed arrangement of distributed system trapeze support groupings.
   5. Indicate proposed locations for distributed system flexible fittings and/or connections.
   6. Indicate locations of seismic separations where applicable.

E. Seismic Design Data:
   1. Compile information on project-specific characteristics of actual installed plumbing components necessary for determining seismic design forces required to design appropriate seismic controls, including but not limited to the following.
      a. Component operating weight and center of gravity.
      b. Component elevation in the building in relation to the roof elevation (z/h).
      c. Component importance factor (Ip).
      d. For distributed systems, component materials and connection methods.
      e. Component amplification factor (ap) and component response modification factor (Rp), determined in accordance with ASCE 7 tables.

F. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Evidence of qualifications for seismic controls designer.

1.07 QUALITY ASSURANCE

A. Comply with applicable building code.

B. Seismic Controls Designer Qualifications: Registered professional engineer licensed in the State in which the Project is located and with minimum five years experience designing seismic restraints for nonstructural components.

PART 2 - PRODUCTS

2.01 SEISMIC CONTROL REQUIREMENTS

A. Design and provide plumbing component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor plumbing components.

B. Component Importance Factor (Ip): Plumbing components essential to life safety to be assigned a component importance factor (Ip) of 1.5 as indicated or as required. This includes but is not limited to:
   1. Plumbing components required to function for life safety purposes after an earthquake.
   2. Plumbing components that support or otherwise contain hazardous substances.

C. Seismic Restraints:
   1. Provide seismic restraints for plumbing components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
   2. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:

a. FEMA 412.
b. FEMA 413.
c. FEMA 414.
d. FEMA E-74.
e. SMACNA (SRM).

3. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third-party registered professional engineer acceptable to authorities having jurisdiction.

D. Seismic Attachments:
1. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
2. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
3. Do not use power-actuated fasteners.
4. Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps.
5. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
6. Concrete Housekeeping Pads:
a. Increase size of pad as required to comply with anchor requirements.
b. Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.

E. Seismic Interactions:
1. Include provisions to prevent seismic impact between plumbing components and other structural or nonstructural components.
2. Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.

F. Seismic Relative Displacement Provisions:
1. Use suitable fittings or flexible connections to accommodate:
a. Relative displacements at connections between components, including distributed systems (e.g., piping); do not exceed load limits for equipment utility connections.
b. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
c. Design displacements at seismic separations.
d. Anticipated drifts between floors.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Secure fasteners according to manufacturer's recommended torque settings.

D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

E. Seismic Controls:
   1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris, or other obstructions.
   2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
   3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch (3 mm), use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch (3 mm) or less.
   4. Equipment with Sheet Metal Housings:
      a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
      b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
      c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
   5. Concrete Housekeeping Pads:
      a. Size in accordance with seismic design to meet anchor requirements.
      b. Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.

END OF SECTION

SECTION 22 0719
PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Cellular glass insulation.

B. Cellular melamine insulation.

C. Flexible elastomeric cellular insulation.

D. Glass fiber insulation.

E. Polyisocyanurate cellular plastic insulation.

F. Weather barrier coatings.

G. Jacketing and accessories.

1.02 REFERENCE STANDARDS

A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

B. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).

C. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

D. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2023.

E. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2022a.

F. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2022.

G. ASTM C585 - Standard Practice for Inner and Outer Diameters of Thermal Insulation for Nominal Sizes of Pipe and Tubing; 2022.

H. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation; 2022.

I. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).

J. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2019.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.

L. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).

M. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.04 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 - PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER INSULATION

A. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
   1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
   2. Maximum Service Temperature: 850 degrees F (454 degrees C).
   3. Maximum Moisture Absorption: 0.2 percent by volume.

B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible, with wicking material to transport condensed water to the outside of the system for evaporation to the atmosphere.
   1. K (Ksi) Value: ASTM C177, 0.23 at 75 degrees F (0.034 at 24 degrees C).
   2. Maximum Service Temperature: 220 degrees F (104 degrees C).
   3. Maximum Moisture Absorption: 0.2 percent by volume.

C. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
   1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
   2. Maximum Service Temperature: 650 degrees F (343 degrees C).
   3. Maximum Moisture Absorption: 0.2 percent by volume.

D. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm (0.029 ng/(Pa s m)).

E. Tie Wire: 0.048 inch (1.22 mm) stainless steel with twisted ends on maximum 12 inch (300 mm) centers.

F. Vapor Barrier Lap Adhesive: Compatible with insulation.

2.03 CELLULAR GLASS INSULATION

A. Insulation: ASTM C552, Type II, Grade 6.
   1. K (Ksi) Value: 0.35 (0.050) at 100 degrees F (38 degrees C).
   2. Service Temperature Range: From 250 degrees F (121 degrees C) to 800 degrees F (427 degrees C).
   3. Water Vapor Permeability: 0.005 perm inch (0.007 ng/(Pa s m)) maximum per inch.
   4. Water Absorption: 0.5 percent by volume, maximum.

2.04 POLYISOCYANURATE CELLULAR PLASTIC INSULATION

A. Insulation Material: ASTM C591, rigid molded modified polyisocyanurate cellular plastic.
   1. Dimension: Comply with requirements of ASTM C585.
   2. K (Ksi) Value: 0.18 at 75 degrees F (0.026 at 24 degrees C), when tested in accordance with ASTM C518.
   3. Minimum Service Temperature: Minus 70 degrees F (Minus 57 degrees C).
   4. Water Absorption: 0.5 percent by volume, maximum, when tested in accordance with ASTM D2842.
   5. Moisture Vapor Transmission: 4.0 perm inch (5.8 ng/(Pa s m)).
   6. Connection: Waterproof vapor barrier adhesive.

2.05 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
   1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
   2. Maximum Service Temperature: 220 degrees F (104 degrees C).
   3. Connection: Waterproof vapor barrier adhesive.

2.06 WEATHER BARRIER COATINGS

A. Weather-Resistive Barrier Coating: Fire-resistive, UV resistant, water-based mastic for use over closed cell polyethylene and polyurethane foam insulation; applied with glass fiber or synthetic reinforcing mesh.
   1. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, Class A, when tested in accordance with ASTM E84.
   2. Water Vapor Permeance: Greater than 1.0 perm (57 ng/(Pa s m)) in accordance with ASTM E96/E96M.

2.07 JACKETING AND ACCESSORIES

A. PVC Plastic Jacket:
   1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum Service Temperature: 0 degrees F (Minus 18 degrees C).
      b. Maximum Service Temperature: 150 degrees F (66 degrees C).
      c. Moisture Vapor Permeability: 0.002 perm inch (0.0029 ng/(Pa s m)), maximum, when tested in accordance with ASTM E96/E96M.
      d. Thickness: 10 mil, 0.010 inch (0.25 mm).
      e. Connections: Brush on welding adhesive.

B. Aluminum Jacket:
   1. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch (0.41 mm) with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.
   2. Thickness: 0.016 inch (0.40 mm) sheet.
   3. Finish: Smooth.
   4. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
   5. Fittings: 0.016 inch (0.40 mm) thick die-shaped fitting covers with factory-attached protective liner.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

C. For hot piping conveying fluids 140 degrees F (60 degrees C) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

D. Inserts and Shields:
   1. Application: Piping 1-1/2 inches (40 mm) diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.

E. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet (3 meters) above finished floor): Finish with canvas jacket sized for finish painting.

F. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil, 0.001 inch (0.025 mm) thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

3.03 SCHEDULES

A. Plumbing Systems:
   1. Domestic Cold & Hot Water Supply:

a. Glass Fiber Insulation:
   1) Thickness: 1 inch and smaller: 1/2 inch thickness
   2) Thickness: 1-1/2 inch and larger: 1 inch thicknness
b. Cellular Glass Insulation:
   1) Thickness: 1 inch and smaller: 1/2 inch thickness.
   2) Thickness: 1-1/2 inch and larger: 1 inch thicknness.

2. Domestic Hot Water Recirculation:
   a. Glass Fiber Insulation:
      1) Thickness: 1 inch (25 mm).

B. Cooling Systems:
1. Condensate Drains from Cooling Coils: Self-Sealing Closed Cell Foam Insulation - 3/4" thick or Heavy-Duty Self -Sealing Jacketed Fiberglass Insulation - 1-1/2" thick
2. Refrigerant Suction: Self-Sealing Closed Cell Foam Insulation - 3/4" thick
3. Refrigerant Hot Gas: Self-Sealing Closed Cell Foam Insulation - 3/4" thick

END OF SECTION

SECTION 22 1005
PLUMBING PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Sanitary waste piping, buried within 5 feet (1500 mm) of building.
B. Sanitary waste piping, above grade.
C. Chemical-resistant sanitary waste piping.
D. Domestic water piping, buried within 5 feet (1500 mm) of building.
E. Domestic water piping, above grade.
F. Storm drainage piping, buried within 5 feet (1500 mm) of building.
G. Storm drainage piping, above grade.
H. Natural gas piping, buried beyond 5 feet (1500 mm) of building.
I. Natural gas piping, buried within 5 feet (1500 mm) of building.
J. Natural gas piping, above grade.
K. Pipe flanges, unions, and couplings.
L. Pipe hangers and supports.
M. Pipe sleeve-seal systems.
N. Ball valves.
O. Butterfly valves.
P. Balancing valves.
Q. Flow-balancing valves.
R. Pressure reducing valves.
S. Pressure relief valves.
T. Control and service valves.
U. Strainers.

1.02 RELATED REQUIREMENTS

A. Section 33 0110.58 - Disinfection of Water Utility Piping Systems.

1.03 REFERENCE STANDARDS

A. ANSI Z21.22 - American National Standard for Relief Valves for Hot Water Supply Systems; 2015 (Reaffirmed 2020).
B. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.
C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
E. ASME B31.1 - Power Piping; 2022.
F. ASME B31.9 - Building Services Piping; 2020.
G. ASSE 1003 - Performance Requirements for Water Pressure Reducing Valves for Potable Water Distribution Systems; 2020.
H. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).
I. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
J. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2021.

K. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

L. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2023a.

M. ASTM B32 - Standard Specification for Solder Metal; 2020.

N. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2020.

O. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.

P. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.

Q. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2016.

R. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2016.

S. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2020a.

T. ASTM D2239 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter; 2022.

U. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2020.

V. ASTM D2609 - Standard Specification for Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe; 2021.

W. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2020.

X. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2021.

Y. ASTM D2846/D2846M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems; 2019a.

Z. ASTM D2855 - Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2020.

AA. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2021.

BB. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.

CC. ASTM F437 - Standard Specification for Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80; 2021.

DD. ASTM F438 - Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40; 2017.

EE. ASTM F439 - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80; 2019.

FF. ASTM F441/F441M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80; 2023.

GG. ASTM F442/F442M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR); 2023.

HH. ASTM F493 - Standard Specification for Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings; 2022.

II. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing; 2023.

JJ. ASTM F1960 - Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-Linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing; 2023a.

KK. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2018.

LL. AWWA C550 - Protective Interior Coatings for Valves and Hydrants; 2017.

MM. AWWA C606 - Grooved and Shouldered Joints; 2022.

NN. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry; 2018, with Editorial Revision (2020).

OO. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2023.

PP. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

QQ. MSS SP-67 - Butterfly Valves; 2022.

RR. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .

SS. NSF 61 - Drinking Water System Components - Health Effects; 2022, with Errata.

TT. NSF 372 - Drinking Water System Components - Lead Content; 2022.

UU. PPI TR-4 - PPI HSB Listing of Hydrostatic Design Basis (HDB), Hydrostatic Design Stress (HDS), Strength Design Basis (SDB), Pressure Design Basis (PDB) and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe; 2021.

VV. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

B. Plenum-Installed Plastic Piping: Flame-spread index equal or below 25 and smoke-spread index equal or below 50 according to ASTM E84 or UL 723 tests.

2.02 SANITARY WASTE PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

A. Cast Iron Pipe: ASTM A74 extra heavy weight.
   1. Fittings: Cast iron.
   2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.

B. PVC Pipe: ASTM D2665 or ASTM D3034.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.03 SANITARY WASTE PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A74, service weight.
   1. Fittings: Cast iron.
   2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

B. PVC Pipe: ASTM D2729.
   1. Fittings: PVC.

2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.04 CHEMICAL-RESISTANT SANITARY WASTE PIPING

A. Special drainage systems for corrosive chemical or acid waste shall be manufactured from CPVC Type IV, ASTM Cell Classification 23447. All system pipe and fittings shall be manufactured in accordance with ASTM F 2618 and certified by NSF International for use in corrosive waste drainage systems with the NSF®-cw mark. All pipe and fittings shall be CAN/ULC S102.2 Listed for flame spread of less than 25 and smoke development of less than 50 as designated on the pipe marking or fitting package labeling. All pipe markings shall be accompanied by a yellow stripe for identification of CPVC chemical waste system. All fittings shall be CPVC drainage patterns meeting the requirements of ASTM D 3311 or the manufacturer's specifications, as applicable. Joining method for pipe and fittings shall be solvent cement welding. Solvent cement shall be a "one-step" primerless type CPVC cement specially formulated for resistance to corrosive chemicals and manufactured in accordance with ASTM F 493. All pipe, fittings, and cement shall be supplied together as a system with a Lifetime Warranty, as Spears® LabWaste CPVC Corrosive Waste Drainage Systems manufactured by Spears® Manufacturing Company.

2.05 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

A. Copper Pipe: ASTM B42, hard drawn.
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
   2. Joints: ASTM B32, alloy Sn95 solder.

B. Copper Pipe: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
   2. Joints: ASTM B32, alloy Sn95 solder.

C. PE Pipe: ASTM D2239.
   1. Fittings: ASTM D2609, PE.
   2. Joints: Mechanical with stainless steel clamp.

2.06 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Pipe: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
   2. Joints: ASTM B32, alloy Sn95 solder.

B. CPVC Pipe: ASTM D2846/D2846M, ASTM F441/F441M, or ASTM F442/F442M.
   1. Fittings: CPVC; ASTM D2846/D2846M, ASTM F437, ASTM F438, or ASTM F439.
   2. Joints: ASTM D2846/D2846M, solvent weld with ASTM F493 solvent cement.

C. Cross-Linked Polyethylene (PEX) Pipe: ASTM F876 or ASTM F877. PEX shall not be acceptable for Hot Water Recirculating systems.
   1. PPI TR-4 Pressure Design Basis:
      a. 160 psig (1102 kPa) at maximum 73 degrees F (23 degrees C).
      b. 100 psig (689 kPa) at maximum 180 degrees F (82 degrees C).
   2. Fittings: Brass and copper.
   3. Fittings: Brass and engineered polymer (EP) ASTM F1960.
   4. Joints: Mechanical compression fittings.
   5. Joints: ASTM F1960 cold-expansion fittings.

2.07 STORM DRAINAGE PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

A. Cast Iron Pipe: ASTM A74 extra heavy weight.
   1. Fittings: Cast iron.
   2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

B. PVC Pipe: ASTM D2665 or ASTM D3034.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.08 STORM DRAINAGE PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A74 extra heavy weight.
   1. Fittings: Cast iron.
   2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

B. PVC Pipe: ASTM D2665.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.09 NATURAL GAS PIPING, BURIED BEYOND 5 FEET (1500 MM) OF BUILDING

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
   1. Fittings: ASTM A234/A234M, wrought steel welding type, with AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil (0.25 mm) polyethylene tape.
   2. Joints: ASME B31.1, welded.

2.10 NATURAL GAS PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
   1. Fittings: ASTM A234/A234M, wrought steel welding type.
   2. Joints: ASME B31.1, welded.
   3. Jacket: AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil (0.25 mm) polyethylene tape.

2.11 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
   1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
   2. Joints: Threaded or welded to ASME B31.1.

2.12 PIPE FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 inch (80 mm, DN) and Under:
   1. Ferrous Pipe: Class 150 malleable iron threaded unions.
   2. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Sizes Over 1 inch (25 mm, DN):
   1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
   2. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
   1. Dimensions and Testing: In accordance with AWWA C606.
   2. Housing Material: Provide ASTM A47/A47M malleable iron, ductile iron, or _____, galvanized.
   3. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
   4. When pipe is field grooved, provide coupling manufacturer's grooving tools.

D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.13 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
   3. Trapeze Hangers: Welded steel channel frames attached to structure.
   4. Vertical Pipe Support: Steel riser clamp.
   5. Floor Supports: Concrete pier or steel pedestal with floor flange; fixture attachment.

6. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:
   a. Bases: High-density polypropylene.
   b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
   c. Steel Components: Stainless steel or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
   d. Attachment and Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion-resistant material.
   e. Height: Provide minimum clearance of 6 inches (150 mm) under pipe to top of roofing.

B. Plumbing Piping - Drain, Waste, and Vent:
   1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm, DN): Malleable iron, adjustable swivel, split ring.
   2. Hangers for Pipe Sizes 2 inch (50 mm, DN) and Over: Carbon steel, adjustable, clevis.
   3. Wall Support for Pipe Sizes to 3 inch (80 mm, DN): Cast iron hook.
   4. Wall Support for Pipe Sizes 4 inch (100 mm, DN) and Over: Welded steel bracket and wrought steel clamp.
   5. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

C. Plumbing Piping - Water:
   1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm, DN): Malleable iron, adjustable swivel, split ring.
   2. Hangers for Cold Pipe Sizes 2 inch (50 mm, DN) and Over: Carbon steel, adjustable, clevis.
   3. Hangers for Hot Pipe Sizes 2 to 4 inch (50 to 100 mm, DN): Carbon steel, adjustable, clevis.
   4. Hangers for Hot Pipe Sizes 6 inch (150 mm, DN) and Larger: Adjustable steel yoke, cast iron pipe roll, double hanger.
   5. Wall Support for Pipe Sizes Up to 3 inch (80 mm, DN): Cast iron hook.
   6. Wall Support for Pipe Sizes 4 inch (100 mm, DN) and Larger: Welded steel bracket and wrought steel clamp.
   7. Wall Support for Hot Pipe Sizes 6 inch (150 mm, DN) and Larger: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron pipe roll.
   8. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   9. Floor Support for Hot Pipe Sizes to 4 inch (100 mm, DN): Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
   10. Floor Support for Hot Pipe Sizes 6 inch (150 mm, DN) and Larger: Adjustable cast iron pipe roll and stand, steel screws, and concrete pier or steel support.
   11. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
   1. Concrete Wedge Expansion Anchors: Comply with ICC-ES AC193.
   2. Masonry Wedge Expansion Anchors: Comply with ICC-ES AC01.
   3. Concrete Screw Type Anchors: Comply with ICC-ES AC193.
   4. Masonry Screw Type Anchors: Comply with ICC-ES AC106.
   5. Concrete Adhesive Type Anchors: Comply with ICC-ES AC308.

2.14 PIPE SLEEVE-SEAL SYSTEMS

A. Modular Mechanical Seals:
   1. Elastomer-based interlocking links continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
   2. Watertight seal between pipe and wall-sleeve, wall or casing opening.
   3. Size and select seal component materials in accordance to service requirements.

4. Glass reinforced plastic pressure end plates.

2.15 BALL VALVES

A. Construction, 4 inch (100 mm, DN) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.

2.16 BUTTERFLY VALVES

A. Construction 1-1/2 inch (40 mm, DN) and Larger: MSS SP-67, 200 psi (1380 kPa) CWP, cast or ductile iron body, nickel-plated ductile iron disc, resilient replaceable EPDM seat, wafer ends, extended neck, 10 position lever handle.

B. Provide gear operators for valves 8 inches (150 mm, DN) and larger, and chain-wheel operators for valves mounted over 8 feet (2400 mm) above floor.

2.17 BALANCING VALVES

A. Construction: Class 125, brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.

B. Calibration: Control flow within five percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi (24 kPa).

2.18 FLOW-BALANCING VALVES

A. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.

B. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi (24 kPa).

2.19 PRESSURE REDUCING VALVES

A. 2 inch (50 mm, DN) and Smaller:
   1. ASSE 1003, bronze body, stainless steel, and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends.
   2. Pressure Reducing Pilot-Operator:
      a. Operating Range: 5 to 50 psi (0.35 to 35 Bar).
      b. Connected into brass or bronze pilot piping and fittings.
      c. Fixed flow restrictor, pressure gauges, and isolation valves.

B. 2 inch (50 mm, DN) and Larger:
   1. ASSE 1003, cast iron body with interior lining complying with AWWA C550, bronze fitted, elastomeric diaphragm and seat disc, flanged.
   2. Pressure Reducing Pilot-Operator:
      a. Operating Range: 5 to 50 psi (0.35 to 35 Bar).
      b. Connected into brass or bronze pilot piping and fittings.
      c. Fixed flow restrictor, strainer, pressure gauges, and isolation valves.

2.20 PRESSURE RELIEF VALVES

A. ANSI Z21.22, AGA certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

2.21 STRAINERS

A. Size 1/2 inch (15 mm, DN) to 3 inch (80 mm, DN):
   1. Class 150, threaded forged bronze Y-pattern body, stainless steel perforated mesh screen with cap, and rated for 150 psi (1,034 kPa), 250 deg F (121.1 deg C) WOG service.

B. Size 2 inch (50 mm, DN) and Smaller:
   1. Threaded brass body for 175 psi (1200 kPa) CWP, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.
   2. Class 150, threaded bronze body 300 psi (2070 kPa) CWP, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.

C. Size 1-1/2 inch (40 mm, DN) to 4 inch (100 mm, DN):
   1. Class 125, flanged iron body, Y pattern with 1/16 inch (1.6 mm) stainless steel perforated screen.

D. Size 5 inch (125 mm, DN) and Larger:
   1. Class 125, flanged iron body, basket pattern with 1/8 inch (3.2 mm) stainless steel perforated screen.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

G. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

H. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

I. Sleeve pipes passing through partitions, walls, and floors.

J. Inserts:
   1. Provide inserts for placement in concrete formwork.
   2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

K. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9.
   2. Support horizontal piping as indicated.
   3. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
   4. Place hangers within 12 inches (300 mm) of each horizontal elbow.

L. Pipe Sleeve-Seal Systems:
   1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
   2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
   3. Locate piping in center of sleeve or penetration.
   4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
   5. Tighten bolting for a watertight seal.
   6. Install in accordance with manufacturer's recommendations.

3.02 FIELD TESTS AND INSPECTIONS

A. Verify and inspect systems according to requirements by the Authority Having Jurisdiction. In the absence of specific test and inspection procedures proceed as indicated below.

B. Test Results: Document and certify successful results, otherwise repair, document, and retest.

3.03 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Disinfect water distribution system in accordance with Section 33 0110.58.

B. Prior to starting work, verify system is complete, flushed, and clean.

C. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

3.04 SERVICE CONNECTIONS

A. Provide new sanitary sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, pressure reducing valve, and sand strainer.

3.05 SCHEDULES

A. Pipe Hanger Spacing:
   1. Metal Piping:
      a. Pipe Size: 1/2 inch (15 mm, DN) to 1-1/4 inch (32 mm, DN):
         1) Maximum Hanger Spacing: 6.5 ft (2 m).
         2) Hanger Rod Diameter: 3/8 inches (9 mm).
      b. Pipe Size: 1-1/2 inch (40 mm, DN) to 2 inch (50 mm, DN):
         1) Maximum Hanger Spacing: 10 ft (3 m).
         2) Hanger Rod Diameter: 3/8 inch (9 mm).
      c. Pipe Size: 2-1/2 inch (65 mm, DN) to 3 inch (80 mm, DN):
         1) Maximum Hanger Spacing: 10 ft (3 m).
         2) Hanger Rod Diameter: 1/2 inch (13 mm).
      d. Pipe Size: 4 inch (100 mm, DN) to 6 inch (150 mm, DN):
         1) Maximum Hanger Spacing: 10 ft (3 m).
         2) Hanger Rod Diameter: 5/8 inch (15 mm).
      e. Pipe Size: 8 inch (200 mm, DN) to 12 inch (300 mm, DN):
         1) Maximum hanger spacing: 14 ft (4.25 m).
         2) Hanger Rod Diameter: 7/8 inch (22 mm).
      f. Pipe Size: 14 inch and Over (350 mm, DN and Over):
         1) Maximum Hanger Spacing: 20 ft (6 m).
         2) Hanger Rod Diameter: 1 inch (25 mm).
   2. Plastic Piping:
      a. All Sizes:
         1) Maximum Hanger Spacing: 6 ft (1.8 m).
         2) Hanger Rod Diameter: 3/8 inch (9 mm).

END OF SECTION

SECTION 22 1006
PLUMBING PIPING SPECIALTIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Cleanouts.
B. Hose bibbs.
C. Hydrants.
D. Washing machine boxes and valves.
E. Refrigerator valve and recessed box.
F. Backwater valves.
G. Double check valve assemblies.
H. Water hammer arrestors.
I. Sanitary waste interceptors.
J. Mixing valves.
K. Relief valves.
L. Air vents.
M. Floor drain trap seals.

1.02 RELATED REQUIREMENTS

A. Section 22 1005 - Plumbing Piping.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
B. ASSE 1012 - Performance Requirements for Backflow Preventers with an Intermediate Atmospheric Vent; 2021.
C. ASSE 1019 - Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance; 2023.
D. NSF 61 - Drinking Water System Components - Health Effects; 2022, with Errata.
E. NSF 372 - Drinking Water System Components - Lead Content; 2022.
F. PDI-WH 201 - Water Hammer Arresters; 2017.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
C. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.02 CLEANOUTS

A. Cleanouts at Exterior Surfaced Areas:
   1. Round cast nickel bronze access frame and non-skid cover.
B. Cleanouts at Exterior Unsurfaced Areas:
   1. Line type with lacquered cast iron body and round epoxy coated gasketed cover.
C. Cleanouts at Interior Finished Floor Areas:

D. Cleanouts at Interior Finished Wall Areas:
   1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

2.03 HYDRANTS

A. Wall Hydrants:
   1. ASSE 1019; freeze resistant, self-draining type with chrome-plated wall plate hose thread spout, handwheel, and integral vacuum breaker.

2.04 WASHING MACHINE BOXES AND VALVES

A. Description: Plastic preformed rough-in box with brass long shank valves with wheel handles, socket for 2 inch (50 mm) waste, slip in finishing cover.

2.05 REFRIGERATOR VALVE AND RECESSED BOX

A. Description: Plastic preformed rough-in box with brass valves with wheel handle, slip in finishing cover.

2.06 BACKWATER VALVES

A. Plastic Backwater Valves: ABS body and valve, extension sleeve, and access cover.

2.07 DOUBLE CHECK-VALVE ASSEMBLIES

A. Double Check Valve Assembly:
   1. ASSE 1012; cast bronze body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent.
   2. Size: 3/4 to 2 inch, NPS (20 to 50 mm, DN) assembly with threaded full port ball valves.

2.08 WATER HAMMER ARRESTORS

A. Water Hammer Arrestors:
   1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F (minus 73 to 149 degrees C) and maximum 250 psi (1700 kPa) working pressure.

2.09 SANITARY WASTE INTERCEPTORS

A. Grease Interceptors:
   1. Construction:
      a. Material: High-density polyethylene.
      b. Rough-in: Fully recessed flush with floor (deep rough-in) with anchor flange.
      c. Cover: Steel, epoxy coated, non-skid with gasket, securing handle, and enzyme injection port, recessed for floor finish.

2.10 MIXING VALVES

A. Thermostatic Mixing Valves:
   1. Valve: Chrome-plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment.

2.11 RELIEF VALVES

A. Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

2.12 AIR VENTS

A. Float Type:
   1. Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.

2.13 FLOOR DRAIN TRAP SEALS

A. Description: Push-fit EPDM or silicone fitting with a one-way membrane.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatory sinks or washing machine outlets.

END OF SECTION

SECTION 221113

FACILITY WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes water-distribution piping and related components outside the building for combined water service and fire-service mains.

B. Utility-furnished products include water meters that will be furnished to the site, ready for installation.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. Comply with ASTM F 645 for selection, design, and installation of thermoplastic water piping.

D. Comply with FMG's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.

E. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.

F. NSF Compliance:

1. Comply with NSF 14 for plastic potable-water-service piping.
2. Comply with NSF 61 Annex G for materials for water-service piping and specialties for domestic water.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:

1. Notify Engineer no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of water-distribution service without Engineer's written permission.

1.7 COORDINATION

A. Coordinate connection to water main with utility company.

PART 2 - PRODUCTS

2.1 PIPES AND FITTINGS

A. Soft Copper Tube: ASTM B 88, Type KASTM B 88, Type L, water tube, annealed temper.

1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.

B. Hard Copper Tube: ASTM B 88, Type K and ASTM B 88, Type L, water tube, drawn temper.

1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.

C. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.

1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

D. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.

1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
2. Gaskets: AWWA C111, rubber.

E. Grooved-Joint, Ductile-Iron Pipe: AWWA C151, with cut, rounded-grooved ends.

1. Grooved-End, Ductile-Iron Pipe Appurtenances:

F. PE, Fire-Service Pipe: ASTM F 714, AWWA C906, or equivalent for PE water pipe; FMG approved, with minimum thickness equivalent to FMG Class 200.

1. Molded PE Fittings: ASTM D 3350, PE resin, socket- or butt-fusion type, made to match PE pipe dimensions and class.

G. PVC, AWWA Pipe: AWWA C900, Class 200, with bell end with gasket, and with spigot end.

1. Comply with UL 1285 for fire-service mains if indicated.
2. PVC Fabricated Fittings: AWWA C900, Class 200, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
3. PVC Molded Fittings: AWWA C907, Class 150, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
4. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

a. Gaskets: AWWA C111, rubber.

5. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

a. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

2.2 JOINING MATERIALS

A. Refer to Section 330500 "Common Work Results for Utilities" for commonly used joining materials.

B. Brazing Filler Metals: AWS A5.8, BCuP Series.

C. Bonding Adhesive for Fiberglass Piping: As recommended by fiberglass piping manufacturer.

D. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

2.3 PIPING SPECIALTIES

A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

B. Tubular-Sleeve Pipe Couplings:

1. Description: Metal, bolted, sleeve-type, reducing or transition coupling, with center sleeve, gaskets, end rings, and bolt fasteners and with ends of same sizes as piping to be joined.

a. Standard: AWWA C219.

2.4 GATE VALVES

A. AWWA, Cast-Iron Gate Valves:

1. Nonrising-Stem, Metal-Seated Gate Valves:

a. Description: Gray- or ductile-iron body and bonnet; with cast-iron or bronze double-disc gate, bronze gate rings, bronze stem, and stem nut.

1) Standard: AWWA C500.
2) Minimum Pressure Rating: 200 psi
3) End Connections: Mechanical joint.
4) Interior Coating: Complying with AWWA C550.

2. Nonrising-Stem, Resilient-Seated Gate Valves:

a. Description: Gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut.

1) Standard: AWWA C509.
2) Minimum Pressure Rating: 200 psi.
3) End Connections: Mechanical joint.
4) Interior Coating: Complying with AWWA C550.

3. Nonrising-Stem, High-Pressure, Resilient-Seated Gate Valves:

a. Description: Ductile-iron body and bonnet; with bronze or ductile-iron gate, resilient seats, bronze stem, and stem nut.

1) Standard: AWWA C509.
2) Minimum Pressure Rating: 250 psi.
3) End Connections: Push on or mechanical joint.
4) Interior Coating: Complying with AWWA C550.

4. OS&Y, Rising-Stem, Metal-Seated Gate Valves:

a. Description: Cast- or ductile-iron body and bonnet, with cast-iron double disc, bronze disc and seat rings, and bronze stem.

1) Standard: AWWA C500.
2) Minimum Pressure Rating: 200 psi.
3) End Connections: Flanged.

5. OS&Y, Rising-Stem, Resilient-Seated Gate Valves:

a. Description: Cast- or ductile-iron body and bonnet, with bronze or gray- or ductile-iron gate, resilient seats, and bronze stem.

1) Standard: AWWA C509.
2) Minimum Pressure Rating: 200 psi.

B. UL/FMG, Cast-Iron Gate Valves:

1. UL/FMG, Nonrising-Stem Gate Valves:

a. Description: Iron body and bonnet with flange for indicator post, bronze seating material, and inside screw.

1) Standards: UL 262 and FMG approved.
2) Minimum Pressure Rating: 175 psi.
3) End Connections: Flanged.

2. OS&Y, Rising-Stem Gate Valves:

a. Description: Iron body and bonnet and bronze seating material.

1) Standards: UL 262 and FMG approved.
2) Minimum Pressure Rating: 175 psi.
3) End Connections: Flanged.

C. Bronze Gate Valves:

1. OS&Y, Rising-Stem Gate Valves:

a. Description: Bronze body and bonnet and bronze stem.

1) Standards: UL 262 and FMG approved.
2) Minimum Pressure Rating: 175 psi.
3) End Connections: Threaded.

2. Nonrising-Stem Gate Valves:

a. Description: Class 125, Type 1, bronze with solid wedge, threaded ends, and malleable-iron handwheel.

1) Standard: MSS SP-80.

2.5 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Tapping-Sleeve Assemblies:

1. Description: Sleeve and valve compatible with drilling machine.

a. Standard: MSS SP-60.
b. Tapping Sleeve: Cast- or ductile-iron or stainless-steel, two-piece bolted sleeve with flanged outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.
c. Valve: AWWA, cast-iron, nonrising-stem, metal resilient-seated gate valve with one raised face flange mating tapping-sleeve flange.

B. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5 inches in diameter.

1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

C. Indicator Posts: UL 789, FMG-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of burial of valve.

2.6 CORPORATION VALVES AND CURB VALVES

A. Service-Saddle Assemblies: Comply with AWWA C800. Include saddle and valve compatible with tapping machine.

1. Service Saddle: Copper alloy with seal and AWWA C800, threaded outlet for corporation valve.
2. Corporation Valve: Bronze body and ground-key plug, with AWWA C800, threaded inlet and outlet matching service piping material.
3. Manifold: Copper fitting with two to four inlets as required, with ends matching corporation valves and outlet matching service piping material.

B. Curb Valves: Comply with AWWA C800. Include bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.

C. Service Boxes for Curb Valves: Similar to AWWA M44 requirements for cast-iron valve boxes. Include cast-iron telescoping top section of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over curb valve and with a barrel approximately 3 inches in diameter.

1. Shutoff Rods: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and slotted end matching curb valve.

2.7 WATER METERS

A. Water meters will be furnished by utility company.

B. Displacement-Type Water Meters:

1. Description: With bronze main case.

a. Standard: AWWA C700.
b. Registration: Flow in cubic feet.

C. Compound-Type Water Meters:

1. Description:

a. Standard: AWWA C702.
b. Registration: Flow in cubic feet.

2.8 BACKFLOW PREVENTERS

A. City of Wynne Specifications.

2.9 WATER METER BOXES

A. Description: Cast-iron body and cover for disc-type water meter, with lettering "WATER METER" in cover; and with slotted, open-bottom base section of length to fit over service piping.

1. Option: Base section may be cast-iron, PVC, clay, or other pipe.

B. Description-1: Cast-iron body and double cover for disc-type water meter, with lettering "WATER METER" in top cover; and with separate inner cover; air space between covers; and slotted, open-bottom base section of length to fit over service piping.

C. Description-2: Polymer-concrete body and cover for disc-type water meter, with lettering "WATER" in cover; and with slotted, open-bottom base section of length to fit over service piping. Include vertical and lateral design loadings of 15,000 lb minimum over 10 by 10 inches square.

2.10 CONCRETE VAULTS

A. Description: Precast, reinforced-concrete vault, designed for A-16 load designation according to ASTM C 857 and made according to ASTM C 858.

1. Ladder: ASTM A 36/A 36M, steel or polyethylene-encased steel steps.
2. Manhole: ASTM A 48/A 48M Class No. 35A minimum tensile strength, gray-iron traffic frame and cover.

a. Dimension: 24-inch minimum diameter, unless otherwise indicated.

3. Manhole-1: ASTM A 536, Grade 60-40-18, ductile-iron traffic frame and cover.

a. Dimension: 24-inch- minimum diameter, unless otherwise indicated.

4. Drain: ASME A112.6.3, cast-iron floor drain with outlet of size indicated. Include body anchor flange, light-duty cast-iron grate, bottom outlet, and integral or field-installed bronze ball or clapper-type backwater valve.

2.11 FIRE HYDRANTS

A. Dry-Barrel Fire Hydrants:

1. Description: Freestanding, with one NPS 4-1/2 and two NPS 2-1/2 outlets, 5-1/4-inch main valve, drain valve, and NPS 6START_SIEND_SI mechanical-joint inlet. Include interior coating according to AWWA C550. Hydrant shall have cast-iron body, compression-type valve opening against pressure and closing with pressure.

a. Standard: AWWA C502.
b. Pressure Rating: 250 psig

2. Description-1: Freestanding, with one NPS 4-1/2 and two NPS 2-1/2 outlets, 5-1/4-inch main valve, drain valve, and NPS 6START_SIEND_SI mechanical-joint inlet. Hydrant shall have cast-iron body, compression-type valve opening against pressure and closing with pressure.

a. Standards: UL 246, FMG approved.
b. Pressure Rating: 250 psig.
c. Outlet Threads: NFPA 1963, with external hose thread used by local fire department. Include cast-iron caps with steel chains.
d. Operating and Cap Nuts: Pentagon, 1-1/2 inches point to flat.

e. Direction of Opening: Open hydrant valve by turning operating nut to left or counterclockwise.
f. Exterior Finish: Red alkyd-gloss enamel paint, unless otherwise indicated.

B. Wet-Barrel Fire Hydrants:

1. Description: Freestanding, with one NPS 4-1/2 and two NPS 2-1/2 outlets, NPS 6 threaded or flanged inlet, and base section with NPS 6 mechanical-joint inlet. Include interior coating according to AWWA C550.

a. Standard: AWWA C503.
b. Pressure Rating: 150 psig minimum.

2. Description-1: Freestanding, with one NPS 4-1/2 and two NPS 2-1/2 outlets, NPS 6 threaded or flanged inlet, and base section with NPS 6 mechanical-joint inlet.

a. Standards: UL 246 and FMG approved.
b. Pressure Rating: 150 psig minimum.
c. Outlet Threads: NFPA 1963, with external hose thread used by local fire department. Include cast-iron caps with steel chains.
d. Operating and Cap Nuts: Pentagon, 1-1/2 inches point to flat.
e. Direction of Opening: Open hydrant valves by turning operating nut to left or counterclockwise.
f. Exterior Finish: Red alkyd-gloss enamel paint, unless otherwise indicated.

2.12 FIRE DEPARTMENT CONNECTIONS

A. Fire Department Connections:

1. Description: Freestanding, with cast-bronze body, thread inlets according to NFPA 1963 and matching local fire department hose threads, and threaded bottom outlet. Include lugged caps, gaskets, and chains; lugged swivel connection and drop clapper for each hose-connection inlet; 18-inch-START_SIEND_SI high brass sleeve; and round escutcheon plate.

a. Standard: UL 405.
b. Connections: Two NPS 2-1/2 inlets and one NPS 6 outlet.
c. Connections-1: Four NPS 2-1/2 inlets and one NPS 6 outlet.
d. Connections-2: Six NPS 2-1/2 inlets and oneSTART_SIEND_SINPS 8 outlet.
e. Inlet Alignment: horizontal.
f. Finish Including Sleeve: Rough chrome-plated.
g. Escutcheon Plate Marking: “STANDPIPE."

PART 3 - EXECUTION

3.1 EARTHWORK

A. Refer to Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING APPLICAITONS

A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.

B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.

C. Do not use flanges or unions for underground piping.

D. Flanges, unions, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.

E. Underground water-service piping NPS 3/4 to NPS 3 shall be soft copper tube, ASTM B 88, Type KASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.

F. Underground water-service piping NPS 4 and NPS 6 shall be any of the following:

1. Soft copper tube, ASTM B 88, Type KASTM B 88, Type Lwrought-copper, solder-joint fittings; and brazed joints.
2. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed joints.
3. NPS 4 and NPS 6: NPS 6 PVC, AWWA Class 150 pipe; PVC, AWWA Class 150 molded fittings; and gasketed joints.

G. Water Meter Box Water-Service Piping NPS 3/4 to NPS 2 shall be same as underground water-service piping.

H. Aboveground Water-Service Piping NPS 3/4 to NPS 3 shall be hard copper tube, ASTM B 88, Type K, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.

I. Aboveground and vault water-service piping NPS 4 and NPS 6 shall be any of the following:

1. Hard copper tube, ASTM B 88, Type KASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.
2. Ductile-iron, grooved-end pipe; ductile-iron, grooved-end appurtenances; and grooved joints.

J. Underground Fire-Service-Main Piping NPS 4 to NPS 8 shall be any of the following:

1. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed joints.
2. PE, Class 200, fire-service pipe; molded PE fittings; and heat-fusion joints.
3. PVC, AWWA Class 150 pipe listed for fire-protection service; PVC Class 150 fabricated or molded fittings; and gasketed joints.
4. PVC, AWWA Class 200 pipe listed for fire-protection service; PVC Class 200 fabricated fittings; and gasketed joints.

K. Aboveground and Vault Fire-Service-Main Piping NPS 4 to NPS 8 shall be ductile-iron, grooved-end pipe; ductile-iron-pipe appurtenances; and grooved

joints.

L. Underground Combined Water-Service and Fire-Service-Main Piping NPS 6 to NPS 10 shall be any of the following:

1. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed joints.
2. PVC, AWWA Class 200 pipe listed for fire-protection service; PVC fabricated or molded fittings of same class as pipe; and gasketed joints.

M. Aboveground and Vault Combined Water Service and Fire-Service-Main Piping NPS 6 to NPS 10 shall be ductile-iron, grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.

3.3 VALVE APPLICATIONS

A. General Application: Use mechanical-joint-end valves for NPS 3START_SIEND_SI and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FMG, nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 and smaller installation.

B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Underground Valves, NPS 3START_SIEND_SI and Larger: AWWA, cast-iron, nonrising-stem, resilient seated gate valves with valve box.
2. Underground Valves, NPS 4START_SIEND_SI and Larger, for Indicator Posts: UL/FMG, cast-iron, nonrising-stem gate valves with indicator post.
3. Use the following for valves in vaults and aboveground:

a. Gate Valves, NPS 2 and Smaller: Bronze, rising stem.
b. Gate Valves, NPS 3 and Larger: AWWA

3.4 PIPING SYSTEMS – COMMON REQUIREMENTS

A. See Section 330500 "Common Work Results for Utilities" for piping-system common requirements.

3.5 PIPING INSTALLATION

A. Water-Main Connection: Arrange with utility company for tap of size and in location indicated in water main.

B. Water-Main Connection-1: Tap water main according to requirements of water utility company and of size and in location indicated.

C. Make connections larger than NPS 2 with tapping machine according to the following:

1. Install tapping sleeve and tapping valve according to MSS SP-60.
2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.

4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.

D. Make connections NPS 2 and smaller with drilling machine according to the following:

1. Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company standards.
2. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.
3. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.
4. Install corporation valves into service-saddle assemblies.
5. Install manifold for multiple taps in water main.
6. Install curb valve in water-service piping with head pointing up and with service box.

E. Comply with NFPA 24 for fire-service-main piping materials and installation.

1. Install copper tube and fittings according to CDA's "Copper Tube Handbook."

F. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.

G. Install PE pipe according to ASTM D 2774 and ASTM F 645.

H. Install PVC, AWWA pipe according to ASTM F 645 and AWWA M23.

I. Bury piping with depth of cover over top at least 30 inches, with top at least 12 inches below level of maximum frost penetration.

J. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations and pipe sizes indicated.

1. Terminate water-service piping at building wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building-water-piping systems when those systems are installed.

K. Sleeves are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

L. Mechanical sleeve seals are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

M. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

3.6 JOINT CONSTRUCTION

A. See Section 330500 "Common Work Results for Utilities" for basic piping joint

construction.

B. Make pipe joints according to the following:

1. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.
2. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.
3. Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with grooved-end, ductile-iron-piping couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions.
4. PE Piping Insert-Fitting Joints: Use plastic insert fittings and fasteners according to fitting manufacturer's written instructions.
5. PVC Piping Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D 2774 or ASTM D 3139 and pipe manufacturer's written instructions.
6. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure.

3.7 ANCHORAGE INSTALLATION

A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:

1. Concrete thrust blocks.
2. Locking mechanical joints.
3. Set-screw mechanical retainer glands.
4. Bolted flanged joints.
5. Heat-fused joints.
6. Pipe clamps and tie rods.

B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:

1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.
2. Gasketed-Joint, PVC Water-Service Piping: According to AWWA M23.
3. Fire-Service-Main Piping: According to NFPA 24.

C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.8 VALVE INSTALLATION

A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.

B. UL/FMG, Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post.

C. MSS Valves: Install as component of connected piping system.

D. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.

3.9 WATER METER INSTALLATION

A. Install water meters, piping, and specialties according to utility company's written instructions.

B. Water Meters: Install displacement-type water meters, NPS 2 and smaller, in meter boxes with shutoff valves on water meter inlets. Include valves on water meter outlets and valved bypass around meters unless prohibited by authorities having jurisdiction.

C. Water Meters-1: Install compound-type water meters, NPS 3 and larger, in meter vaults. Include shutoff valves on water meter inlets and outlets and valved bypass around meters. Support meters, valves, and piping on brick or concrete piers.

3.10 BACKFLOW PREVENTER INSTALLATION

A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.

B. Do not install backflow preventers that have relief drain in vault or in other spaces subject to flooding.

C. Do not install bypass piping around backflow preventers.

D. Support NPS 2-1/2 and larger backflow preventers, valves, and piping near floor and on brick or concrete piers.

3.11 WATER METER BOX INSTALLATION

A. Install water meter boxes in paved areas flush with surface.

B. Install water meter boxes in grass or earth areas with top 2 inchesSTART_SIEND_SI above surface.

3.12 CONCRETE VAULT INSTALLATION

A. Install precast concrete vaults according to ASTM C 891.

3.13 FIRE HYDRANT INSTALLATION

A. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.

B. Wet-Barrel Fire Hydrants: Install with valve below frost line. Provide for drainage.

C. AWWA Fire Hydrants: Comply with AWWA M17.

D. UL/FMG Fire Hydrants: Comply with NFPA 24.

3.14 FIRE DEPARTMENT CONNECTION INSTALLATION

A. Install protective pipe bollards on two sides of each fire department connection. Pipe bollards are specified in Section 055000 "Metal Fabrications."

3.15 CONNECTIONS

A. See Section 330500 "Common Work Results for Utilities" for piping connections to valves and equipment.

B. Connect water-distribution piping to existing water main. Use tapping sleeve and tapping valve.

C. Connect water-distribution piping to interior domestic water and fire-suppression piping.

D. Connect waste piping from concrete vault drains to sanitary sewerage system. See Section 221313 "Facility Sanitary Sewers" for connection to sanitary-sewer piping.

3.16 FIELD QUALITY CONTROL

A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.

1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

C. Prepare reports of testing activities.

3.17 IDENTIFICATION

A. Install continuous underground detectable warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Section 312000 "Earth Moving."

B. Permanently attach equipment nameplate or marker indicating plastic water-service piping, on main electrical meter panel. See Section 330500 "Common Work Results for Utilities" for identifying devices.

3.18 CLEANING

A. Clean and disinfect water-distribution piping as follows:

1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.

3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:

    a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
    b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
    c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
    d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports of purging and disinfecting activities.

END OF SECTION

SECTION 221313

FACILITY SANITARY SEWERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Hub-and-spigot, cast-iron soil pipe and fittings.
2. Hubless cast-iron soil pipe and fittings.
3. Nonpressure-type transition couplings.
4. Pressure-type pipe couplings.
5. Expansion joints and deflection fittings.
6. Backwater valves.
7. Cleanouts.
8. Encasement for piping.
9. Manholes.
10. Concrete.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For manholes. Include plans, elevations, sections, details, and frames and covers.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings:

1. Show system piping in profile. Draw profiles to horizontal scale of not less than 1 inch equals 50 feet and to vertical scale of not less than 1 inch equals 5 feet. Indicate manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing system piping.

B. Product Certificates: For each type of pipe and fitting.

C. Field quality-control reports.

PART 2 - PRODUCTS

2.1 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service and Extra-Heavy classes and Extra-Heavy class.

B. Gaskets: ASTM C 564, rubber.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.2 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. CISPI-Trademark, Shielded Couplings:

1. Description: ASTM C 1277 and CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

C. Heavy-Duty, Shielded Couplings:

1. Description: ASTM C 1277 and ASTM C 1540, with stainless-steel shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.3 PVC PIPE AND FITTINGS

A. PVC Corrugated Sewer Piping:

1. Pipe: ASTM F 949, PVC corrugated pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM F 949, PVC molded or fabricated, socket type.

B. PVC Type PSM Sewer Piping:

1. Pipe: ASTM D 3034, SDR 35, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM D 3034, PVC with bell ends.
3. Gaskets: ASTM F 477, elastomeric seals.

2.4 NONPRESSURE-TYPE TRANSITION COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling; for joining underground nonpressure piping. Include ends of same sizes as piping to be joined and include corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:

1. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
2. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
3. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. Unshielded, Flexible Couplings:

1. Description: Elastomeric sleeve with stainless-steel shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Ring-Type, Flexible Couplings:

1. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

E. Nonpressure-Type, Rigid Couplings:

1. Description: ASTM C 1461, sleeve-type, reducing- or transition-type mechanical coupling; molded from ASTM C 1440, TPE material; with corrosion-resistant-metal tension band and tightening mechanism on each end.

2.5 BACKWATER VALVES

A. Cast-Iron Backwater Valves:

1. Description: ASME A112.14.1, gray-iron body and bolted cover, with bronze seat.
2. Horizontal type; with swing check valve and hub-and-spigot ends.
3. Combination horizontal and manual gate-valve type; with swing check valve, integral gate valve, and hub-and-spigot ends.
4. Terminal type; with bronze seat, swing check valve, and hub inlet.

B. PVC Backwater Valves:

1. Description: Horizontal type; with PVC body, PVC removable cover, and PVC swing check valve.

2.6 CLEANOUTS

A. Cast-Iron Cleanouts:

1. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
2. Top-Loading Classification(s): Heavy Duty and Extra-Heavy Duty.
3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

2.7 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105/A21.5.

B. Material: Linear low-density polyethylene film of 0.008-inch or high-density, cross-laminated polyethylene film of 0.004-inch minimum thickness.

C. Form: Sheet.

D. Color: natural.

2.8 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.

4. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section; with separate base slab or base section with integral floor.
5. Riser Sections: 4-inchSTART_SIEND_SI minimum thickness, of length to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated; with top of cone of size that matches grade rings.
7. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
8. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
9. Steps: No Steps.
10. Adjusting Rings: Interlocking HDPE rings, with level or sloped edge in thickness and diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
11. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, with diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch ID by 7- to 9-inch riser, with 4-inch-minimum-width flange and 26-inch- diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "SANITARY SEWER."
2. Material: ASTM A 536, Grade 60-40-18 ductile iron unless otherwise indicated.

2.9 CONCRETE

A. General: Cast-in-place concrete complying with ACI 318, ACI 350, and the following:

1. Cement: ASTM C 150/C 150M, Type II.
2. Fine Aggregate: ASTM C 33/C 33M, sand.
3. Coarse Aggregate: ASTM C 33/C 33M, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 1064/A 1064M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

a. Invert Slope: 2 percent through manhole.

2. Benches: Concrete, sloped to drain into channel.

a. Slope: 4 percent.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A1064/A 1064M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 deformed steel.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details to indicate general location and arrangement of underground sanitary sewer piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

F. Install gravity-flow, nonpressure, drainage piping according to the following:

1. Install piping pitched down in direction of flow, at minimum slope of 2 percent unless otherwise indicated.
2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place-concrete supports or anchors.
3. Install piping with 48-inch minimum cover.
4. Install hub-and-spigot, cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
5. Install hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
6. Install PVC corrugated sewer piping according to ASTM D 2321 and ASTM F 1668.

7. Install PVC Type PSM sewer piping according to ASTM D 2321 and ASTM F 1668.

G. Install corrosion-protection piping encasement over the following underground metal piping according to ASTM A 674 or AWWA C105/A21.5:

1. Hub-and-spigot, cast-iron soil pipe.
2. Hubless cast-iron soil pipe and fittings.
3. Expansion joints and deflection fittings.

H. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure, drainage piping according to the following:

1. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
2. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.
3. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.
4. Join PVC corrugated sewer piping according to ASTM D 2321.
5. Join PVC Type PSM sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.
6. Join dissimilar pipe materials with nonpressure-type, flexible couplings.

B. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

1. Use nonpressure flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.

a. Unshielded flexible couplings for pipes of same or slightly different OD.
b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.4 MANHOLE INSTALLATION

A. General: Install manholes complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

C. Form continuous concrete channels and benches between inlets and outlet.

D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere unless otherwise indicated.

3.5 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.6 BACKWATER VALVE INSTALLATION

A. Install horizontal-type backwater valves in piping manholes or pits.

B. Install combination horizontal and manual gate-type valves in piping and in manholes.

C. Install terminal-type backwater valves on end of piping and in manholes. Secure units to sidewalls.

3.7 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts, and use cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.
3. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
4. Use Extra-Heavy-Duty, top-loading classification cleanouts in roads.

B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.8 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping to building's sanitary building drains specified in Section 221316 "Sanitary Waste and Vent Piping."

B. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch overlap with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
2. Make branch connections from side into existing piping, NPS 4 to NPS 20Remove section of existing pipe, install wye fitting into existing

piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.

3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes by cutting opening into existing unit large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of, and be flush with, inside wall unless otherwise indicated. On outside of pipe or manhole wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

    a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
    b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

4. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.9 CLOSING ABANDONED SANITARY SEWER SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

1. Close open ends of piping with at least 8-inch- thick, brick masonry bulkheads.
2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

B. Abandoned Manholes: Excavate around manhole as required and use either procedure below:

1. Remove manhole and close open ends of remaining piping.
2. Remove top of manhole down to at least 36 inches below final grade. Fill to within 12 inches of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.

C. Backfill to grade according to Section 312000 "Earth Moving."

3.10 IDENTIFICAITON

A. Comply with requirements in Section 312000 "Earth Moving" for underground utility identification devices. Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.

1. Use warning tape or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground manholes.

3.11 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate report for each system inspection.
2. Defects requiring correction include the following:

    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
    d. Infiltration: Water leakage into piping.
    e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:

    a. Fill sewer piping with water. Test with pressure of at least 10-footSTART_SIEND_SI head of water, and maintain such pressure without leakage for at least 15 minutes.
    b. Close openings in system and fill with water.
    c. Purge air and refill with water.
    d. Disconnect water supply.
    e. Test and inspect joints for leaks.

6. Manholes: Perform hydraulic test according to ASTM C 969

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

END OF SECTION

SECTION 22 3000
PLUMBING EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Residential electric water heaters.

B. Light-commercial / Residential electric water heaters.

1.02 REFERENCE STANDARDS

A. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittals procedures.

B. Product Data:
   1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
   2. Indicate pump type, capacity, power requirements.
   3. Provide electrical characteristics and connection requirements.

C. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer warranty for domestic water heaters.

PART 2 - PRODUCTS

2.01 WATER HEATERS

A. Light-commmercial / Residential Electric Water Heaters:
   1. Type: Automatic, electric, vertical storage.
   2. Minimum Efficiency Required: ASHRAE Std 90.1 I-P.
   3. Performance:
      a. Maximum Working Pressure: 150 psig (1000 kPa).
   4. Electrical Characteristics: As noted on drawings.
   5. Tank: Glass lined welded steel, thermally insulated with one inch (25 mm) thick glass fiber; encased in corrosion-resistant steel jacket; baked-on enamel finish.
   6. Controls: Automatic water thermostat with externally adjustable temperature range from 120 to 170 degrees F (49 to 77 degrees C), flanged or screw-in nichrome elements, enclosed controls and electrical junction box and operating light. Wire double element units so elements do not operate simultaneously.
   7. Accessories:
      a. Water Connections: Brass.
      b. Water Heater Mounting Brackets: Water heater manufacturer's factory-fabricated steel bracket for wall mounting and capable of supporting water heater and water.
      c. Drain Pans: Corrosion-resistant metal with raised edge. Include dimensions not less than base of water heater and include drain outlet not less than NPS 3/4.
      d. Dip Tube: Brass.
      e. Drain valve.
      f. Anode: Magnesium.
      g. Temperature and Pressure Relief Valve: ASME labeled.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.

B. Coordinate with plumbing piping and related fuel piping work to achieve operating system.

END OF SECTION

SECTION 22 4000
PLUMBING FIXTURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Plumbing Fixtures.

1.02 RELATED REQUIREMENTS

A. Section 06 4100 - Architectural Wood Casework: Counters for sinks and lavatories.

B. Section 07 9200 - Joint Sealants: Sealing joints between fixtures and walls and floors.

C. Section 22 1005 - Plumbing Piping.

D. Section 22 1006 - Plumbing Piping Specialties.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASME A112.18.1 - Plumbing Supply Fittings; 2018, with Errata.

C. ASME A112.19.1 - Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures; 2018.

D. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks; 2022.

E. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2020.

F. NSF 61 - Drinking Water System Components - Health Effects; 2022, with Errata.

G. NSF 372 - Drinking Water System Components - Lead Content; 2022.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on-site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer warranty for electric water cooler.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 PLUMBING FIXTURES

A. Plumbing fixtures shall be equal to type and manufacturer scheduled on the drawings.

B. All plumbing fixtures shall be approved by Architect and Owner prior to beginning work. All substitutions shall be approved prior to bid.

C. Tubs must have minimum dimensions of 30” x 60” and equipped with anti-scald valves.

D. Water closets must comply with applicable ANSI, UFAS, and Fair Housing Accessibility Guidelines.

E. Minimum depth of double bowl kitchen sinks shall be 6-1/2”.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.02 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Install components level and plumb.

3.03 CLEANING

A. Clean plumbing fixtures and equipment.

3.04 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Do not permit use of fixtures by construction personnel.

C. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 23 0513
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. General construction and requirements.

B. Applications.

1.02 REFERENCE STANDARDS

A. NEMA MG 1 - Motors and Generators; 2021.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

PART 2 - PRODUCTS

2.01 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Construction:
   1. Open drip-proof type except where specifically noted otherwise.
   2. Design for continuous operation in 104 degrees F (40 degrees C) environment.
   3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.

B. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

C. Wiring Terminations:
   1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
   2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.02 APPLICATIONS

A. Exception: Motors less than 250 watts, for intermittent service may be the equipment manufacturer's standard and need not comply with these specifications.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

END OF SECTION

SECTION 23 0529
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Support and attachment components.

1.02 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping; 2023.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).

F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.

G. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).

H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

J. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.

L. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).

M. FM (AG) - FM Approval Guide; Current Edition.

N. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

O. UL (DIR) - Online Certifications Directory; Current Edition.

P. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.

1.04 QUALITY ASSURANCE

A. Comply with applicable building code.

PART 2 - PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
4. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
   a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
   b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Prefabricated Trapeze-Framed Metal Strut Systems:
1. Strut Channel or Bracket Material:
   a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
   b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
2. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch (2.66 mm).
3. Minimum Channel Dimensions: 1-5/8 inch (41 mm) width by 13/16 inch (21 mm) height.
4. Accessories: Provide bracket covers, cable basket clips, cable tray clips, clamps, conduit clamps, fire-retarding brackets, j-hooks, protectors, and vibration dampeners.

C. Strut Channels:
1. ASTM A653/A653M galvanized steel bracket with clamps for surface mounting of piping or plumbing equipment support.
2. Channel or Bracket Kits: Include rods, brackets, end-fixed fittings, covers, clips, and other related hardware required to complete sectional trapeze section for piping or other support.

D. Hanger Rods:
1. Threaded zinc-plated steel unless otherwise indicated.

E. Cable Hanging System Kits:
1. Provide cable-wire in bulk or precut lengths with respective cable hangers as required to hold minimum weight of 120 lb (54.4 kg).

F. Thermal Insulated Pipe Supports:
1. General Requirements:
   a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
   b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
   c. Pipe supports to be provided for nominally sized, 1/2 to 30 inch (15 to 750 mm, DN) iron pipes.
   d. Insulation inserts to consist of rigid polyisocyanurate (urethane) insulation surrounded by a 360 degree, PVC jacketing.
2. PVC Jacket:
   a. Pipe insulation protection shields to be provided with a ball bearing hinge and locking seam.
   b. Moisture Vapor Transmission: 0.0071 perm inch (0.0092 ng/Pa s m), when tested in accordance with ASTM E96/E96M.
   c. Thickness: 60 mil (1.524 mm).

G. Pipe Supports:
1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
2. Liquid Temperatures Up To 122 degrees F (50 degrees C):
   a. Overhead Support: MSS SP-58 Types 1, 3 through 12.

b. Support From Below: MSS SP-58 Types 35 through 38.

H. Nonpenetrating Pipe Supports:

I. Roller Chairs:
1. MSS SP-58 type 43 based on required load, nonconductive and corrosion resistant.
2. Steel Yoke Type: MSS SP-58 type 44, vertically adjustable, nonconductive, and corrosion resistant.
3. Material: Zinc plated ASTM A36/A36M carbon steel or ASTM A47/A47M malleable iron.

J. Pipe Stanchions:
1. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
2. Provide coated or plated saddles to isolate steel hangers from dissimilar metal tube or pipe.
3. For pipe runs, use stanchions of same type and material where vertical adjustment is required for stationary pipe.

K. Riser Clamps:
1. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.
2. MSS SP-58 type 1 or 8, carbon steel or steel with epoxy plated, plain, stainless steel, or zinc plated finish.
3. Medium Split Horizontal Pipe Clamp: MSS SP-58 type 4, carbon steel or stainless steel with epoxy plated, plain, stainless steel, or zinc plated finish.
4. Copper Tube Pipe Clamp: MSS SP-58 type 8, epoxy plated copper.
5. UL (DIR) listed: Pipe sizes 1/2 to 8 inch (15 to 200 mm, DN).

L. Strut Clamps:
1. Pipe Clamp: Two-piece rigid, universal, or outer diameter type, carbon steel with epoxy copper or zinc finish.

M. Pipe Hangers:
1. Split Ring Hangers:
a. Provide hinged split ring and yoke roller hanger with epoxy copper or plain finish.
b. Material: ASTM A47/A47M malleable iron or ASTM A36/A36M carbon steel.
c. Provide hanger rod and nuts of the same type and material for a given pipe run.
d. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.
2. J-Hangers, Adjustable:
a. MSS SP-58 Type 5, Zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.
3. Swivel Ring Hangers, Adjustable:
a. MSS SP-58 Type 10, epoxy-painted, zinc-colored.
b. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
c. FM (AG) and UL (DIR) listed for specific pipe size runs and loads.
4. Clevis Hangers, Adjustable:
a. Copper Tube: MSS SP-58 Type 1, epoxy-plated copper.
b. Felt-Lined: MSS SP-58 Type 1, zinc-plated, silicone-free carbon steel.
c. Light-Duty: MSS SP-58 Type 1, zinc-colored, epoxy plated.
d. UL (DIR) listed: Pipe sizes 2-1/2 to 8 inch (65 to 200 mm, DN).

N. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.

O. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

F. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.

G. Equipment Support and Attachment:
   1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
   2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Secure fasteners according to manufacturer's recommended torque settings.

I. Remove temporary supports.

END OF SECTION

SECTION 23 0548
VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Vibration isolation requirements.

B. Seismic control requirements.
   1. Includes requirements for seismic qualification of equipment not specified in this section.

C. Vibration-isolated equipment support bases.

D. Vibration isolators.

E. Seismic restraint systems.

F. Vibration-isolated and/or seismically engineered roof curbs.

1.02 DEFINITIONS

A. HVAC Component: Where referenced in this section in regards to seismic controls, applies to any portion of the HVAC system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., ductwork, piping).

B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

1.03 REFERENCE STANDARDS

A. ASCE 19 - Structural Applications of Steel Cables for Buildings; 2016.

B. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.

C. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment; 2014.

D. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.

E. FEMA 414 - Installing Seismic Restraints for Duct and Pipe; 2004.

F. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.

G. MFMA-4 - Metal Framing Standards Publication; 2004.

H. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
   1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.
   2. Seismic Controls: Include seismic load capacities.

PART 2 - PRODUCTS

2.01 VIBRATION ISOLATION REQUIREMENTS

A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing HVAC equipment and/or HVAC connections to vibration-isolated equipment.

B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:

C. General Requirements:
   1. Select vibration isolators to provide required static deflection.
   2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.

D. Piping Isolation:
   1. Provide vibration isolators for piping supports:
      a. Located in equipment rooms.
      b. Located within 50 feet (15.2 m) of connected vibration-isolated equipment and pressure-regulating valve (PRV) stations.

2.02 SEISMIC CONTROL REQUIREMENTS

A. Design and provide HVAC component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor HVAC components.

B. Component Importance Factor (Ip): HVAC components to be assigned a component importance factor (Ip) of 1.5 unless otherwise indicated.

C. Component Importance Factor (Ip): HVAC components essential to life safety to be assigned a component importance factor (Ip) of 1.5 as indicated or as required. This includes but is not limited to:
   1. HVAC components required to function for life safety purposes after an earthquake.
   2. HVAC components that support or otherwise contain hazardous substances.

D. Seismic Restraints:
   1. Provide seismic restraints for HVAC components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
   2. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:
      a. ASHRAE (HVACA).
      b. FEMA 412.
      c. FEMA 413.
      d. FEMA 414.
      e. FEMA E-74.
      f. SMACNA (SRM).
   3. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third-party registered professional engineer acceptable to authorities having jurisdiction.
   4. Seismic Restraint Systems:
      a. Except where otherwise restricted, use of either cable or rigid restraints is permitted.
      b. Use only cable restraints to restrain vibration-isolated HVAC components, including distributed systems.
      c. Use only one restraint system type for a given HVAC component or distributed system (e.g., ductwork, piping) run; mixing of cable and rigid restraints on a given component/run is not permitted.
      d. Size restraint elements, including anchorage, to resist seismic loads as necessary to restrain HVAC component in all lateral directions; consider bracket geometry in anchor load calculations.
      e. Use rod stiffener clips to attach bracing to hanger rods as required to prevent rod buckling from vertical (upward) compressive load introduced by cable or rigid restraints loaded in tension, in excess of downward tensile load due to supported HVAC component weight.
      f. Select hanger rods and associated anchorage as required to accommodate vertical (downward) tensile load introduced by rigid restraints loaded in compression, in addition to downward tensile load due to supported HVAC component weight.

g. Clevis hangers may only be used for attachment of transverse restraints; do not use for attachment of longitudinal restraints.
h. Where seismic restraints are attached to clevis hangers, provide clevis bolt reinforcement accessory to prevent clevis hanger deformation.
i. Do not introduce lateral loads on open bar joist chords or the weak axis of beams, or loads in any direction at other than panel points unless approved by project Structural Engineer of Record.

5. Ductwork Applications:
a. Provide independent support and seismic restraint for in-line components (e.g., fans, heat exchangers, humidifiers) having an operating weight greater than 75 pounds (334 N).
b. Positively attach appurtenances (e.g., dampers, louvers, diffusers) with mechanical fasteners.

E. Seismic Attachments:
1. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
2. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
3. Do not use power-actuated fasteners.
4. Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps.
5. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
6. Concrete Housekeeping Pads:
a. Increase size of pad as required to comply with anchor requirements.
b. Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.

F. Seismic Interactions:
1. Include provisions to prevent seismic impact between HVAC components and other structural or nonstructural components.
2. Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.

G. Seismic Relative Displacement Provisions:
1. Use suitable fittings or flexible connections to accommodate:
a. Relative displacements at connections between components, including distributed systems (e.g., ductwork, piping); do not exceed load limits for equipment utility connections.
b. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
c. Design displacements at seismic separations.
d. Anticipated drifts between floors.

2.03 VIBRATION-ISOLATED EQUIPMENT SUPPORT BASES

2.04 VIBRATION ISOLATORS

A. General Requirements:
1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
2. Spring Elements for Spring Isolators:
a. Color code or otherwise identify springs to indicate load capacity.
b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.

c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.
e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
f. Selected to function without undue stress or overloading.

B. Vibration Isolators for Nonseismic Applications:
1. Resilient Material Isolator Pads:
a. Description: Single or multiple layer pads utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material.
b. Pad Thickness: As required for specified minimum static deflection; minimum 0.25 inch (6 mm) thickness.
c. Multiple Layer Pads: Provide bonded, galvanized sheet metal separation plate between each layer.

2.05 SEISMIC RESTRAINT SYSTEMS

A. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

B. Cable Restraints:
1. Comply with ASCE 19.
2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
4. Use protective thimbles for cable loops where potential for cable damage exists.

C. Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Secure fasteners according to manufacturer's recommended torque settings.

D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

E. Vibration Isolation Systems:
1. Vibration-Isolated Equipment Support Bases:
2. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
3. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
4. Adjust isolators to be free of isolation short circuits during normal operation.
5. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

F. Seismic Controls:

1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris, or other obstructions.
2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch (3 mm), use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch (3 mm) or less.
4. Equipment with Sheet Metal Housings:
   a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
   b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
   c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
5. Concrete Housekeeping Pads:
   a. Size in accordance with seismic design to meet anchor requirements.
   b. Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.
6. Seismic Restraint Systems:
   a. Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.
   b. Install restraints within permissible angles in accordance with seismic design.
   c. Install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.
   d. Install cable restraints for vibration-isolated components slightly slack to prevent short-circuiting of isolation.
   e. Install hanger rod stiffeners where indicated using only specified clamps; do not weld stiffeners to hanger rod.

END OF SECTION

SECTION 23 0553
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe markers.

1.02 RELATED REQUIREMENTS

A. Section 09 9123 - Interior Painting: Identification painting.

1.03 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Air Handling Units: Nameplates.

B. Control Panels: Nameplates.

C. Piping: Tags.

D. Small-sized Equipment: Tags.

E. Tanks: Nameplates.

2.02 NAMEPLATES

A. Letter Color: White.

B. Letter Height: 1/4 inch (6 mm).

2.03 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch (40 mm) diameter.

2.04 PIPE MARKERS

A. Color: Comply with ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

D. Underground Plastic Pipe Markers: Bright-colored continuously printed plastic ribbon tape, minimum 6 inches (150 mm) wide by 4 mil, 0.004 inch (0.10 mm) thick, manufactured for direct burial service.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Apply stencil painting in accordance with Section 09 9123.

D. Install plastic pipe markers in accordance with manufacturer's instructions.

E. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

F. Install underground plastic pipe markers 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.

G. Use tags on piping 3/4 inch (20 mm) diameter and smaller.

END OF SECTION

SECTION 23 0593
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

1.02 REFERENCE STANDARDS

A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.

B. ASHRAE Std 110 - Methods of Testing Performance of Laboratory Fume Hoods; 2016, with Errata.

C. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008, with Errata (2019).

D. NEBB (TAB) - Procedural Standard for Testing Adjusting and Balancing of Environmental Systems; 2019.

E. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.

C. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
   1. Include at least the following in the plan:
      a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
      b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
      c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
      d. Final test report forms to be used.
      e. Exhaust fan balancing and capacity verifications, including any required room pressure differentials.
      f. Procedures for formal deficiency reports, including scope, frequency and distribution.

D. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
   1. Revise TAB plan to reflect actual procedures and submit as part of final report.
   2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
   3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
   4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
   5. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
   1. SMACNA (TAB).

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. TAB Agency Qualifications:
   1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
   2. Certified by one of the following:
      a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
      b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
      c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.

D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.
   2. Temperature control systems are installed complete and operable.
   3. Proper thermal overload protection is in place for electrical equipment.
   4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
   5. Duct systems are clean of debris.
   6. Fans are rotating correctly.
   7. Fire and volume dampers are in place and open.
   8. Air coil fins are cleaned and combed.
   9. Access doors are closed and duct end caps are in place.
   10. Air outlets are installed and connected.
   11. Duct system leakage is minimized.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

3.03 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 10 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.04 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:
   1. Running log of events and issues.
   2. Discrepancies, deficient or uncompleted work by others.
   3. Contract interpretation requests.
   4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.05 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Measure air quantities at air inlets and outlets.

C. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

D. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

E. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

F. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

G. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

H. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

I. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches (12.5 Pa) positive static pressure near the building entries.

3.06 SCOPE

A. Test, adjust, and balance the following:
1. Air Cooled Refrigerant Condensers.
2. Packaged Roof Top Heating/Cooling Units.
3. Packaged Terminal Air Conditioning Units.
4. Air Coils.
5. Air Handling Units.
6. Fans.
7. Air Filters.
8. Air Terminal Units.
9. Air Inlets and Outlets.

3.07 MINIMUM DATA TO BE REPORTED

A. Electric Motors:
1. Manufacturer.
2. Model/Frame.
3. HP/BHP.
4. Phase, voltage, amperage; nameplate, actual, no load.

B. V-Belt Drives:
1. Identification/location.
2. Required driven RPM.

C. Air Cooled Condensers:
1. Identification/number.
2. Location.
3. Manufacturer.
4. Model number.
5. Serial number.
6. Entering DB air temperature, design and actual.
7. Leaving DB air temperature, design and actual.

D. Cooling Coils:
1. Identification/number.
2. Location.
3. Service.
4. Manufacturer.
5. Air flow, design and actual.

6. Entering air DB temperature, design and actual.
7. Entering air WB temperature, design and actual.
8. Leaving air DB temperature, design and actual.
9. Leaving air WB temperature, design and actual.
10. Air pressure drop, design and actual.

E. Heating Coils:
1. Identification/number.
2. Location.
3. Service.
4. Manufacturer.
5. Air flow, design and actual.
6. Entering air temperature, design and actual.
7. Leaving air temperature, design and actual.
8. Air pressure drop, design and actual.

F. Air Moving Equipment:
1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Arrangement/Class/Discharge.
6. Air flow, specified and actual.
7. Fan RPM.

G. Exhaust Fans:
1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Air flow, specified and actual.
6. Total static pressure (total external), specified and actual.
7. Inlet pressure.
8. Discharge pressure.
9. Sheave Make/Size/Bore.
10. Fan RPM.

H. Air Distribution Tests:
1. Air terminal number.
2. Room number/location.
3. Terminal type.
4. Terminal size.
5. Area factor.
6. Design velocity.
7. Design air flow.
8. Test (final) velocity.
9. Test (final) air flow.
10. Percent of design air flow.

I. Sound Level Reports:
1. Location.
2. Octave bands - equipment off.
3. Octave bands - equipment on.

END OF SECTION

SECTION 23 0713
DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Duct insulation.

B. Duct liner.

C. Weather barrier coatings.

D. Jacketing and accessories.

1.02 REFERENCE STANDARDS

A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

B. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

C. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2023.

D. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).

E. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

F. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings; 2019 (Reapproved 2022).

G. ASTM C1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers; 2015 (Reapproved 2022).

H. ASTM C1423 - Standard Guide for Selecting Jacketing Materials for Thermal Insulation; 2021.

I. ASTM C1775 - Standard Specification for Laminate Protective Jacket and Tape for Use Over Thermal Insulation for Outdoor Applications; 2022.

J. ASTM D5590 - Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay; 2017 (Reapproved 2021).

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.

L. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).

M. SAE AMS3779 - Tape, Adhesive, Pressure-Sensitive Thermal Radiation Resistant, Aluminum Coated Glass Cloth; 2016b.

N. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

O. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, FLEXIBLE

A. Manufacturer:

B. Insulation: ASTM C553; flexible, noncombustible blanket.
   1. K (Ksi) value: 0.36 at 75 degrees F (0.052 at 24 degrees C), when tested in accordance with ASTM C518.
   2. Maximum Service Temperature: 1,200 degrees F (649 degrees C).

2.03 GLASS FIBER, RIGID

A. Insulation: ASTM C612; rigid, noncombustible blanket.
   1. K (Ksi) Value: 0.24 at 75 degrees F (0.036 at 24 degrees C), when tested in accordance with ASTM C518.
   2. Maximum Service Temperature: 450 degrees F (232 degrees C).

2.04 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1, in sheet form.
   1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
   2. Maximum Service Temperature: 180 degrees F (82 degrees C).
   3. Connection: Waterproof vapor barrier adhesive.

2.05 WEATHER BARRIER COATINGS

A. Weather-Resistive Barrier Coating: Fire-resistive, UV resistant, water-based mastic for use over closed cell polyethylene and polyurethane foam insulation; applied with glass fiber or synthetic reinforcing mesh.
   1. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, Class A, when tested in accordance with ASTM E84.
   2. Water Vapor Permeance: Greater than 1.0 perm (57 ng/(Pa s m)) in accordance with ASTM E96/E96M.
   3. Resistance to Fungal Growth: No growth when tested in accordance with ASTM D5590.

2.06 JACKETING AND ACCESSORIES

A. Mineral Fiber (Outdoor) Jacket: Asphalt impregnated and coated sheet, 50 lb/square (2.45 kg/sq m).

B. Aluminum Jacket:
   1. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch (0.41 mm) with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.
   2. Thickness: 0.016 inch (0.40 mm) sheet.
   3. Finish: Smooth.
   4. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
   5. Fittings: 0.016 inch (0.40 mm) thick die-shaped fitting covers with factory-attached protective liner.
   6. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.015 inch (0.38 mm) thick aluminum.

C. Aluminum-Foil Laminate Jacket:
   1. Factory-applied, pressure sensitive adhesive jacketing to comply with ASTM C1775.

D. Flexible Weather-Proofing Outdoor Jacket: Self-healing, field-applied outdoor cladding.

1. Material: Aluminum foil/polymer laminate with rubberized asphalt layer and acrylic adhesive.
2. Thickness: 34 mil, 0.034 inch (0.86 mm).
3. Finish: Embossed.
4. Color: Silver.
5. Water Vapor Transmission: 0.002 perm inch (0.0029 ng/(Pa s m)), maximum, when tested in accordance with ASTM E96/E96M.
6. Mold Resistance: Pass when tested in accordance with ASTM C1338.
7. Emissivity: 0.30 when tested in accordance with ASTM C1371.

E. Reinforced Tape:
1. FSK tape suitable for sealing seams between insulation, insulated elbows, and fittings resulting in a tight, smooth surface without wrinkles.
2. Comply with UL 723 or ASTM E84.
3. Moisture Vapor Permeability: 0.00 perm inch (0.00 ng/(Pa s m)), when tested in accordance with ASTM E96/E96M.
4. Finish: Match insulation.

2.07 DUCT LINER

A. Elastomeric Foam Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1, in sheet form.
1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
2. Maximum Service Temperature: 180 degrees F (82 degrees C).
3. Connection: Waterproof vapor barrier adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

A. Test ductwork for design pressure prior to applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulated Ducts Conveying Air Below Ambient Temperature:
1. Provide insulation with vapor barrier jackets.
2. Finish with tape and vapor barrier jacket.
3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

D. Insulated Ducts Conveying Air Above Ambient Temperature:
1. Provide with or without standard vapor barrier jacket.
2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

E. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces (below 10 feet above finished floor) ((below 3 meters above finished floor)): Finish with canvas jacket sized for finish painting.

F. Exterior Applications: Provide insulation with vapor barrier jacket.

G. Slope exterior ductwork to shed water.

H. External Duct Insulation Application:
1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
2. Secure insulation without vapor barrier with staples, tape, or wires.
3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.

4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

I. Duct and Plenum Liner Application:
1. Adhere insulation with adhesive for 90 percent coverage.
2. Secure insulation with mechanical liner fasteners. Refer to SMACNA (DCS) for spacing.
3. Seal and smooth joints. Seal and coat transverse joints.
4. Seal liner surface penetrations with adhesive.
5. Duct dimensions indicated are net inside dimensions required for airflow. Increase duct size to allow for insulation thickness.

3.03 SCHEDULES

A. Exhaust Ducts Within 10 ft (3 m) of Exterior Openings: 2"

B. Exhaust Ducts Exposed to Outdoor Air: 2"

C. Outside Air Intake Ducts: 2"

D. Supply Ducts: 2"

E. Return and Relief Ducts in Mechanical Rooms: 2"

F. Ducts Exposed to Outdoors: 2"

END OF SECTION

SECTION 23 0913
INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Control panels.

B. Dampers.

C. HVAC&R Sensors:
   1. Temperature sensors.
   2. Humidity sensors.
   3. Static pressure (air pressure) sensors.
   4. Current sensors.

D. Thermostats:
   1. Electric room thermostats.
   2. Line voltage thermostats.
   3. Room thermostat accessories.

1.02 REFERENCE STANDARDS

A. NEMA DC 3 - Residential Controls - Electrical Wall-Mounted Room Thermostats; 2013.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

C. Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Submit schedule of valves indicating size, flow, and pressure drop for each valve. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.

D. Designer's qualification statement.

E. Project Record Documents: Record actual location of control components, including panels, thermostats, and sensors.

1.04 QUALITY ASSURANCE

A. Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this work and licensed in the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

PART 2 - PRODUCTS

2.01 EQUIPMENT - GENERAL

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.02 CONTROL PANELS

A. Unitized cabinet type for each system under automatic control with relays and controls mounted in cabinet and temperature indicators, pressure gauges, pilot lights, push buttons and switches flush on cabinet panel face.

B. Provide common keying for all panels.

2.03 DAMPERS

A. See Section 23 3300 for dampers and this section for actuators and operators.

2.04 HVAC&R SENSORS

A. Temperature Sensors:

1. Use thermistor or RTD type temperature sensing elements with characteristics resistant to moisture, vibration, and other conditions consistent with the application without affecting accuracy and life expectancy.

B. Humidity Sensors:
   1. Duct Mounted Sensor: Voltage type encased in a die-cast metal, weather-proof housing.

2.05 THERMOSTATS

A. Electric Room Thermostats:
   1. Type: NEMA DC 3, 24 volts, with setback/setup temperature control.
   2. Service: Cooling only.
   3. Covers: Locking with set point adjustment, with thermometer.

B. Line Voltage Thermostats:
   1. Dead Band: Maximum 2 degrees F (one degree C).

C. Room Thermostat Accessories:
   1. Thermostat Covers: Brushed aluminum.
   2. Thermostat Guards: Metal mounted on separate base.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that systems are ready to receive work.

C. Beginning of installation means installer accepts existing conditions.

D. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.

E. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

F. Ensure installation of components is complementary to installation of similar components.

G. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check and verify location of thermostats with plans and room details before installation. Locate 48 inches (1200 mm) above floor. Align with lighting switches and humidistats; see Section 26 2726.

C. Provide conduit and electrical wiring in accordance with Section 26 0583. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

END OF SECTION

SECTION 23 2300
REFRIGERANT PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Piping.

B. Refrigerant.

C. Moisture and liquid indicators.

D. Valves.

E. Strainers.

F. Filter-driers.

G. Exterior penetration accessories.

1.02 RELATED REQUIREMENTS

A. Section 23 0716 - HVAC Equipment Insulation.

1.03 REFERENCE STANDARDS

A. AHRI 710 (I-P) - Performance Rating of Liquid-Line Driers; 2009.

B. AHRI 711 (SI) - Performance Rating of Liquid-Line Driers; 2009.

C. ASHRAE Std 34 - Designation and Safety Classification of Refrigerants; 2022, with Errata (2023).

D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.

E. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; 2018.

F. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; 2022.

G. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

H. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.

I. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.

J. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2020.

K. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.

L. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide general assembly of specialties, including manufacturer's catalogue information. Provide manufacturer's catalog data including load capacity.

PART 2 - PRODUCTS

2.01 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure integrity of system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Liquid Indicators:
   1. If receiver is provided, install in liquid line leaving receiver.

C. Valves:
   1. Use gauge taps at compressor inlet and outlet.

D. Refrigerant Charging (Packed Angle) Valve: Use in liquid line between receiver shut-off valve and expansion valve.

E. Strainers:

F. Filter-Driers:
   1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.

2.02 REGULATORY REQUIREMENTS

2.03 PIPING

A. Copper Tube: ASTM B280, H58 hard drawn or O60 soft annealed.
   1. Fittings: ASME B16.22 wrought copper.
   2. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.

B. Copper Tube to 7/8-inch (22 mm) OD: ASTM B88 (ASTM B88M), Type K (A), annealed.
   1. Fittings: ASME B16.26 cast copper.
   2. Joints: Flared.

C. Pipe Supports and Anchors:
   1. Provide hangers and supports that comply with MSS SP-58.
      a. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch (13 to 38 mm): Malleable iron adjustable swivel, split ring.
   3. Hangers for Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
   4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   5. Wall Support for Pipe Sizes to 3 Inches (75 mm): Cast iron hook.
   6. Wall Support for Pipe Sizes 4 Inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.
   7. Vertical Support: Steel riser clamp.
   8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
   10. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
   11. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.
   12. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:
      a. Bases: High density, UV tolerant, polypropylene or reinforced PVC.
      b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
      c. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
      d. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.
      e. Height: Provide minimum clearance of 6 inches (150 mm) under pipe to top of roofing.

2.04 REFRIGERANT

A. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.

B. Refrigerant: R-410A, R-454B, or R-32 as defined in ASHRAE Std 34.

2.05 MOISTURE AND LIQUID INDICATORS

A. Indicators: Single port type, UL listed, with copper or brass body, flared or soldered ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F (93 degrees C) and maximum working pressure of 500 psi (3450 kPa).

2.06 VALVES

A. Packed Angle Valves:
   1. Forged brass or nickel plated forged steel, forged brass seal caps with copper gasket, rising stem and seat with backseating, molded stem packing, soldered or flared ends; for maximum working pressure of 500 psi (3450 kPa) and maximum temperature of 275 degrees F (135 degrees C).

B. Ball Valves:
   1. Two piece bolted forged brass body with teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of 500 psi (3450 kPa) and maximum temperature of 300 degrees F (149 degrees C).

C. Service Valves:
   1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or soldered ends, for maximum pressure of 500 psi (3450 kPa).

2.07 STRAINERS

A. Straight Line or Angle Line Type:
   1. Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass; for maximum working pressure of 430 psi (2960 kPa).

2.08 FILTER-DRIERS

A. Performance:
   1. Flow Capacity - Liquid Line: _____ ton (_____ kW), minimum, rated in accordance with AHRI 710 (I-P) (AHRI 711 (SI)).
   2. Pressure Drop: 2 psi (14 kPa), maximum, when operating at full connected evaporator capacity.
   3. Design Working Pressure: 350 psi (2410 kPa), minimum.

B. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.

C. Construction: UL listed.
   1. Connections: As specified for applicable pipe type.

2.09 EXTERIOR PENETRATION ACCESSORIES

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

B. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install refrigeration specialties in accordance with manufacturer's instructions.

B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and avoid interference with use of space.

D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

E. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.5.
   2. Support horizontal piping as indicated.
   3. Install hangers to provide minimum 1/2 inch (13 mm) space between finished covering and adjacent work.
   4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
   5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

F. Insulate piping and equipment.

END OF SECTION

SECTION 23 3100
HVAC DUCTS AND CASINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Metal ducts.

B. Flexible ducts.

C. Air plenums and casings.

D. Ducts for kitchen exhaust applications.

1.02 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

B. Section 09 9113 - Exterior Painting: Weld priming, weather resistant, paint or coating.

C. Section 09 9123 - Interior Painting: Weld priming, paint or coating.

D. Section 11 4000 - Foodservice Equipment: Kitchen range hoods.

E. Section 23 0713 - Duct Insulation: External insulation and duct liner.

F. Section 23 3319 - Duct Silencers.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.

D. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

E. ASTM E2336 - Standard Test Methods for Fire Resistive Grease Duct Enclosure Systems; 2020.

F. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2021.

G. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.

H. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2024.

I. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

J. SMACNA (FGD) - Fibrous Glass Duct Construction Standards; 2021.

K. SMACNA (KVS) - Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines; 2001.

L. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Current Edition, Including All Revisions.

M. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.

N. UL 1978 - Grease Ducts; Current Edition, Including All Revisions.

O. UL 2221 - Tests of Fire Resistive Grease Duct Enclosure Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for duct materials.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Provide UL Class 1 ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A and SMACNA (DCS) guidelines unless stated otherwise.

B. Provide metal duct unless otherwise indicated. Fibrous glass duct can be substituted at the Contractor's option.

C. Acoustical Treatment: Provide sound-absorbing liners and sectional silencers for metal-based ducts in compliance with Section 23 3319.

D. Duct Shape and Material in accordance with Allowed Static Pressure Range:
   1. Round: Plus or minus 2 in-wc (500 Pa) of galvanized steel.
   2. Rectangular: Plus or minus 1/2 in-wc (125 Pa) of galvanized steel.
   3. Fibrous Glass Duct-board: Plus or minus 1/2 in-wc (125 Pa).

E. Duct Sealing and Leakage in accordance with Static Pressure Class:
   1. Duct Pressure Class and Material for Common Mechanical Ventilation Applications:
      a. Supply Air: 1/2 in-wc (125 Pa) pressure class, galvanized steel.
      b. Outside Air Intake: 1/2 in-wc (125 Pa) pressure class, galvanized steel.
      c. Return and Relief Air: 1/2 in-wc (125 Pa) pressure class, galvanized steel.
      d. General Exhaust Air: 1/2 in-wc (125 Pa) pressure class, galvanized steel.
   2. Low Pressure Service: Up to 2 in-wc (500 Pa):
      a. Seal: Class C, apply to seal off transverse joints.
      b. Leakage:
         1) Rectangular: Class 24 or 24 cfm/100 sq ft (680 Lpm/9.3 sq m).
         2) Round: Class 12 or 12 cfm/100 sq ft (340 Lpm/9.3 sq m).
   3. Low Pressure Service: From 2 in-wc (500 Pa) to 3 in-wc (750 Pa):
      a. Seal: Class B, apply sealing of transverse joints and longitudinal seams.
      b. Leakage:
         1) Rectangular: Class 12 or 12 cfm/100 sq ft (340 Lpm/9.3 sq m).
         2) Round: Class 6 or 6 cfm/100 sq ft (170 Lpm/9.3 sq m).

F. Duct Fabrication Requirements:
   1. Duct and Fitting Fabrication and Support: SMACNA (DCS) including specifics for continuously welded round and oval duct fittings.
   2. Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.
   3. Construct tees, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide airfoil turning vanes of perforated metal with glass fiber insulation.
   4. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
   5. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
   6. Provide turning vanes of perforated metal with glass fiber insulation when an acoustical lining is required.
   7. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.02 METAL DUCTS

A. Material Requirements:
   1. Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

B. Rectangular Metal Duct:

1. Rectangular Double Wall Insulated: Rectangular spiral lock seam duct with galvanized steel outer wall, perforated galvanized steel inner wall; fitting with the solid inner wall.
   a. Insulation:
      1) Thickness: 1 inch (25 mm).
      2) Material: Air.

C. Flat-Oval Metal Ducts:
1. Flat-Oval Single Wall Duct: Machine made from a round spiral lock seam duct.
   a. Fittings: Manufacture at least two gauges heavier metal than the duct.
   b. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.

D. Round Metal Ducts:
1. Round Single Wall Duct: Round lock seam duct with galvanized steel outer wall.
2. Round Double Wall Insulated Duct: Round spiral lock seam duct with galvanized steel outer wall, perforated galvanized steel inner wall; fitting with the solid inner wall.
   a. Insulation:
      1) Thickness: 1 inch (25 mm).
      2) Material: Air.
3. Round Connection System: Interlocking duct connection system per SMACNA (DCS).

E. Connectors, Fittings, Sealants, and Miscellaneous:
1. Fittings: Manufacture with solid inner wall of perforated galvanized steel.
2. Transverse Duct Connection System: SMACNA "E" rated rigid class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).
3. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
   a. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
   b. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
4. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

F. Flexible Ducts: UL 181, Class 1, polyethylene film, mechanically fastened and rolled using galvanized steel to form a spiral helix.
1. Insulation: R6 insulation with polyethylene vapor barrier film.
2. Pressure Rating: 10 in-wc (2.50 kPa) positive and 5 in-wc (1.25 kPa) negative.
3. Maximum Velocity: 5500 fpm (27.9 m/sec).
4. Temperature Range: Minus 20 degrees F to 250 degrees F (Minus 28 degrees C to 121 degrees C).

2.03 FLEXIBLE DUCTS

A. Flexible Air Ducts:
1. UL 181, Class 1, multiple layers of aluminum laminate supported by helically wound spring steel wire.
2. Pressure Rating: From 10 in-wc (2.5 kPa) positive to 1 in-wc (250 Pa) negative.
3. Maximum Velocity: 4,000 fpm (20.3 m/s).
4. Temperature Range: Minus 20 to 210 degrees F (Minus 28 to 99 degrees C).

2.04 AIR PLENUMS AND CASINGS

A. Fabricate in accordance with SMACNA (DCS) for indicated operating pressures indicated.

B. Minimum Fabrication Requirements:
1. Fabricate acoustic plenum or casing with reinforcing turned inward.
2. Provide 16-gauge, 0.059-inch (1.52 mm) sheet steel back facing and 22-gauge, 0.029-inch (0.76 mm) perforated sheet steel front facing with 3/32 inch (2.4 mm) diameter holes on 5/32 inch (4 mm) centers.

3. Construct panels 3 inches (75 mm) thick, packed with 4.5 pcf (72 kg/cu m) minimum glass fiber insulation media, on inverted channel of 16-gauge, 0.059-inch (1.52 mm) sheet steel.
4. Mount floor-mounted plenum or casings on 4-inch (100 mm) high concrete curbs. At floor, rivet panels on 8-inch (200 mm) centers to angles. Where floors are acoustically insulated, provide liner of galvanized 18-gauge, 0.052-inch (1.31 mm) expanded metal mesh supported at 12-inch (300 mm) centers, turned up 12 inches (300 mm) at sides with sheet metal shields.

C. Access Doors:
1. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection.
2. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles.
3. Provide clear wire glass observation ports, minimum 6 by 6 inch (150 by 150 mm) size.

2.05 DUCTS FOR KITCHEN EXHAUST APPLICATIONS

A. Provide ductwork, fittings, and appurtenances per NFPA 96, SMACNA (KVS), UL 1978, and UL 2221 requirements and guidelines.

B. Class 1 duct for air with gas and grease particle exhaust at an air velocity of 1,500 to 2,500 fpm (7.6 to 12.7 m/s).

C. Where ducts are not self-draining back to equipment, provide low-point drain pocket with the copper drain pipe to a sanitary sewer.

D. Design, fabricate, and install liquidtight preventing exhaust leakage into building.

E. Dishwasher Exhaust Duct:
1. Duct Size: 1/2 in-wc (125 Pa) pressure class stainless steel.
2. Fabricate using single wall, 20-gauge, 0.035-inch (0.95 mm) Type 304 stainless steel with external welded joints.
3. Seal joints during installation with factory-supplied overlapping V-bands and sealant.

F. Kitchen Hood and Grease Exhaust Duct:
1. Fabricate in accordance with ductwork manufacturer's instructions, SMACNA (DCS), SMACNA (KVS), and NFPA 96.
2. Round, Double-Wall, Premanufactured Grease Exhaust Ducts:
   a. Nominal 1 inch (25.4 mm) thick, body soluble fiber insulation that fills annular space between inner liner of 20-gauge, 0.035 inch (0.95 mm) Type 304 stainless steel and outer jacket of 24-gauge, 0.023-inch (0.61 mm) aluminized steel.
   b. Seal joints during installation with factory-supplied overlapping V-bands and sealant.
3. Zero Clearance, 2-Hour Fire-Rated, Round, Double-Wall, Premanufactured Grease Duct:
   a. UL Listed and labeled to UL 1978 and UL 2221.
   b. Nominal 3 inches (76.2 mm) thick, high density body soluble fiber insulation between 20-gauge, 0.035-inch (0.95 mm) Type 304 stainless steel liner, and 24-gauge, 0.0239-inch (0.61 mm) aluminized steel sheet outer jacket.
   c. Seal joints during installation with factory-supplied overlapping V-bands and sealant.
   d. Through-penetration firestop listed to UL 1479 or ASTM E814.
4. Zero Clearance, 2-Hour Fire-Rated, Rectangular, Double-Wall, Premanufactured Grease Duct:
   a. Listed when tested in accordance with UL 1978 and ASTM E2336.
   b. Construct of 16-gauge, 0.059-inch (1.52 mm) sheet steel using continuous external welded joints in rectangular sections.
   c. Construct of 18-gauge, 0.050-inch (1.27 mm) stainless steel using continuous external welded joints in rectangular sections.
   d. Liquidtight with continuous external weld for seams and joints.
   e. Where ducts are not self-draining back to equipment, provide low-point drain pocket with copper drain pipe to sanitary sewer.
   f. Through-penetration firestop listed to UL 1479 or ASTM E814.
5. Grease Exhaust Duct Access Doors:

a. Listed when tested in accordance with UL 1978.
b. Provide with preinsulated door to comply with ASTM E2336.
c. Install hinged access doors where indicated or required for access for cleaning and inspection of duct.
d. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA (DCS).

B. Install products following the manufacturer's instructions.

C. Comply with safety standards NFPA 90A and NFPA 90B.

D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

E. Fibrous Glass Ducts: Install per SMACNA (FGD). Obtain manufacturer's inspection and acceptance of fabrication and installation at beginning of installation.

F. Flexible Ducts: Connect to metal ducts with adhesive.

G. Kitchen Range Hoods: Install when provided by Section 11 4000 then fit-out with respective ductwork and accessories to interconnect exhaust system.

H. Kitchen Hood Exhaust: Provide residue traps at the base of vertical risers with provisions for the cleanout.

I. Duct sizes indicated are precise inside dimensions. For lined ducts, maintain sizes inside lining.

J. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

K. Fire Partitions: Provide firestopping sealing. See Section 07 8400.

L. Duct Insulation: Provide duct insulation. See Section 23 0713.

M. Painting: Provide surface finish as indicated on drawings. See Sections 09 9113 and 09 9123.

END OF SECTION

SECTION 23 3300
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Backdraft dampers - metal.

B. Backdraft dampers - fabric.

C. Combination fire and smoke dampers.

D. Combination fire and smoke dampers - corridor dampers.

E. Duct access doors.

F. Duct test holes.

G. Fire dampers.

H. Smoke dampers.

I. Volume control dampers.

J. Miscellaneous Products:
   1. Damper operators.
   2. Damper position switch.

1.02 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2021.

B. NFPA 92 - Standard for Smoke Control Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2024.

D. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

E. UL 33 - Safety Heat Responsive Links for Fire-Protection Service; Current Edition, Including All Revisions.

F. UL 555 - Standard for Fire Dampers; Current Edition, Including All Revisions.

G. UL 555S - Standard for Smoke Dampers; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide for shop-fabricated assemblies including volume control dampers, duct access doors, duct test holes, and hardware used. Include electrical characteristics and connection requirements.

PART 2 PRODUCTS

2.01 BACKDRAFT DAMPERS - METAL

A. Gravity Backdraft Dampers, Size 18 by 18 inches (450 by 450 mm) or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

2.02 BACKDRAFT DAMPERS - FABRIC

A. Fabric Backdraft Dampers: Factory-fabricated.
   1. Blades: Neoprene coated fabric material.
   2. Birdscreen: 1/2 inch (12 mm) nominal mesh of galvanized steel or aluminum.
   3. Maximum Velocity: 1000 fpm (5 mps) face velocity.

2.03 COMBINATION FIRE AND SMOKE DAMPERS

A. Fabricate in accordance with NFPA 90A, UL 555, UL 555S, and as indicated.

B. Provide factory sleeve and collar for each damper.

C. Multiple Blade Dampers: Fabricate with 16 gauge, 0.0598 inch (1.52 mm) galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 by 1/2 inch (3.2 by 12.7 mm) plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch (12.7 mm) actuator shaft.

D. Operators: UL listed and labeled; spring-return, electric-type suitable for 120 volts, single phase, 60 Hz. Provide end switches to indicate damper position. Locate damper operator on interior of duct and link to damper operating shaft.

E. Normally Open Smoke Responsive Fire Dampers: Curtain type, closing upon actuation of electro thermal link, flexible stainless steel blade edge seals to provide constant sealing pressure, stainless steel springs with locking devices to ensure positive closure for units mounted horizontally.

2.04 COMBINATION FIRE AND SMOKE DAMPERS - CORRIDOR DAMPERS

A. Provide factory sleeve and collar for each damper.

B. Multiple Blade Dampers: Fabricate with 16 gauge, 0.0598 inch (1.52 mm) galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 by 1/2 inch (3.2 by 12.7 mm) plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch (12.7 mm) actuator shaft.

C. Operators: UL listed and labeled; spring-return, electric type suitable for 120 volts, single phase, 60 Hz. Provide end switches to indicate damper position. Locate damper operator on interior of duct and link to damper operating shaft.

D. Normally Open Smoke Responsive Fire Dampers: Curtain type, closing upon actuation of electro thermal link, flexible stainless steel blade edge seals to provide constant sealing pressure, stainless steel springs with locking devices to ensure positive closure for units mounted horizontally.

2.05 DUCT ACCESS DOORS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Fabrication: Rigid and close fitting of galvanized steel with sealing gaskets and quick-fastening locking devices. For insulated ducts, install minimum 1-inch (25 mm) thick insulation with sheet metal cover.
   1. Less Than 12 inches (300 mm) Square: Secure with sash locks.
   2. Up to 18 inches (450 mm) Square: Provide two hinges and two sash locks.
   3. Up to 24 by 48 inches (600 by 1200 mm): Three hinges and two compression latches with outside and inside handles.
   4. Larger Sizes: Provide an additional hinge.

2.06 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.07 FIRE DAMPERS

A. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.

B. Horizontal Dampers: Galvanized steel, 22-gauge, 0.0299-inch (0.76 mm) frame, stainless steel closure spring, and lightweight, heat-retardant, non-asbestos fabric blanket.

C. Multiple Blade Dampers: 16-gauge, 0.0598-inch (1.52 mm) galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 by 1/2 inch (3.2 by 12.7 mm) plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.

D. Fusible Links: UL 33, separate at 160 degrees F (71 degrees C) with adjustable link straps for combination fire/balancing dampers.

2.08 SMOKE DAMPERS

A. Fabricate in accordance with NFPA 90A and UL 555S, and as indicated.

B. Dampers: UL Class 1 airfoil blade type smoke damper, normally open automatically operated by pneumatic actuator.

C. Electro Thermal Link: Fusible link melting at 165 degrees F (74 degrees C); 120 volts, single phase, 60 Hz; UL listed and labeled.

2.09 VOLUME CONTROL DAMPERS

A. Splitter Dampers:
   1. Material: Same gauge as duct to 24 inches (600 mm) size in either direction, and two gauges heavier for sizes over 24 inches (600 mm).
   2. Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.
   3. Operator: Minimum 1/4 inch (6 mm) diameter rod in self aligning, universal joint action, flanged bushing with set screw.

B. Single Blade Dampers:
   1. Fabricate for duct sizes up to 6 by 30 inch (150 by 760 mm).
   2. Blade: 24 gauge, 0.0239 inch (0.61 mm), minimum.

C. Multi-Blade Damper: Fabricate consisting of opposed blades with maximum blade sizes 8 by 72 inches (200 by 1825 mm). Assemble center- and edge-crimped blades in prime-coated or galvanized-channel frame with suitable hardware.

D. End Bearings: Except in round ducts 12 inches (300 mm) and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

E. Quadrants:
   1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
   2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
   3. Where rod lengths exceed 30 inches (750 mm) provide regulator at both ends.

2.10 MISCELLANEOUS PRODUCTS

A. Damper Operators: Provide electric operators; see Section 25 3513.

B. Damper position switch; see Section 25 3516.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). See Section 23 3100 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96 Provide minimum 8 by 8 inch (200 by 200 mm) size access door for hand and shoulder access, or as indicated on drawings. Provide minimum 4 by 4 inch (100 by 100 mm) size access door for balancing dampers only. Review locations prior to fabrication.

D. Provide duct test holes where indicated and required for testing and balancing purposes.

E. Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire-rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

F. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92.

G. Demonstrate re-setting of fire dampers to Owner's representative.

H. Use splitter dampers only where indicated.

I. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

SECTION 23 3600
AIR TERMINAL UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single-duct terminal units.
   1. Constant-volume units.
   2. Variable-volume units.

1.02 RELATED REQUIREMENTS

A. Section 23 0513 - Common Motor Requirements for HVAC Equipment.

B. Section 23 0548 - Vibration and Seismic Controls for HVAC.

C. Section 23 3100 - HVAC Ducts and Casings.

D. Section 23 3300 - Air Duct Accessories.

E. Section 23 3700 - Air Outlets and Inlets.

F. Section 25 1400 - Integrated Automation Local Control Units: HVAC controllers.

1.03 REFERENCE STANDARDS

A. AHRI 880 (I-P) - Performance Rating of Air Terminals; 2017 (Reaffirmed 2023).

B. ASHRAE Std 62.1 - Ventilation for Acceptable Indoor Air Quality; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. ASHRAE Std 130 - Laboratory Methods of Testing Air Terminal Units; 2016.

D. ASTM A492 - Standard Specification for Stainless Steel Rope Wire; 1995 (Reapproved 2019).

E. ASTM A603 - Standard Specification for Metallic-Coated Steel Structural Wire Rope; 2019.

F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

G. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.

1.04 ADMINISTRATIVE REQUIREMENTS

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings that indicate airflow, static pressure, and NC designation. Include electrical characteristics and connection requirements.

C. Shop Drawings: Indicate configuration, general assembly, and materials used in fabrication, and electrical characteristics and connection requirements.

PART 2 PRODUCTS

2.01 SINGLE-DUCT, VARIABLE-VOLUME AND CONSTANT-VOLUME UNITS

A. General:
   1. Factory-assembled, AHRI 880 (I-P) rated and bearing the AHRI seal, air volume control terminal with damper assembly, flow sensor, externally mounted volume controller, duct collars, and all required features.
   2. Control box bearing identification, including but not necessarily limited to nominal cfm, maximum and minimum factory-set airflow limits, coil type and coil (right or left hand) connection, where applicable.

B. Unit Casing:
   1. Minimum 22 gauge, 0.0299 inch (0.76 mm) galvanized steel.
   2. Air Inlet Collar: Provide round, suitable for standard flexible duct sizes.
   3. Unit Discharge: Rectangular, with slip-and-drive connections.
   4. Acceptable Liners:

a. Liner not to contain pentabrominated diphenyl ether (CAS #32534-81-9) or octabrominated diphenyl ether.

C. Damper Assembly:
1. Heavy-gauge, galvanized steel, or extruded aluminum construction with solid steel, nickel-plated shaft pivoting on HDPE, self-lubricating bearings.
2. Provide integral position indicator or alternative method for indicating damper position over full range of 90 degrees.
3. Incorporate low leak damper blades for tight airflow shutoff.

D. Electric Heating Coil:
1. Listed and provided by the terminal unit manufacturer.
2. Coil Casing: 20 gauge, 0.0359 inch (0.92 mm) galvanized steel.
3. Heating Elements: Nickel chrome, supported by ceramic insulators.
4. Integral Control Panel: NEMA 250, Type 2 enclosure with hinged access door for access to all controls and safety devices.
5. Furnish a primary automatic reset thermal cutout and differential pressure airflow switch for proof of airflow.
6. Provide the following additional components, mounted and/or wired within the control enclosure:
   a. Fused or non-fused door interlocking disconnect switch.
   b. Mercury contactors.
   c. Fuse block.
7. Factory wired, including all limit switches and steps of control as indicated on the equipment schedule, with the SSR (solid-state relay) proportional heat control.
8. Provide SCR (Silicon Controlled Rectifier) controller.

E. Controls:
1. DDC (Direct-Digital Controls):
   a. Bi-directional Damper Actuator: 24 volt, powered closed, spring return open.
   b. Microprocessor-Based Controller: Air volume controller, pressure-independent with electronic airflow transducers, factory-calibrated maximum and minimum CFMs.
      1) Occupied and unoccupied operating mode.
      2) Remote reset of temperature or CFM set points.
      3) Proportional, plus integral control of room temperature.
      4) Monitoring and adjusting with portable terminal.
   c. Room Sensor:
      1) Compatible with temperature controls specified.
      2) Wall-mounted, system powered, with temperature set-point adjustment including connection access for portable operator terminal.
   d. See Section 25 1400.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install the inlets of air terminal units and air flow sensors a minimum of four duct diameters from elbows, transitions, and duct takeoffs.

C. Provide ceiling access doors or locate units above easily removable ceiling components.

D. Support units individually from structure with wire rope complying with ASTM A492 and ASTM A603 in accordance with SMACNA (SRM). See Section 23 0548.

E. Do not support from ductwork.

F. Connect to ductwork in accordance with Section 23 3100.

3.02 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

3.03 CLEANING

A. See Section 01 7419 - Construction Waste Management and Disposal for additional requirements.

3.04 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals for closeout submittals.

END OF SECTION

SECTION 23 3700
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Diffusers, Registers and grilles for HVAC.

1.02 REFERENCE STANDARDS

A. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

PART 2 PRODUCTS

2.01 DIFFUSERS, REGISTERS AND GRILLES

A. Devices shall be of the type, size and manufacture as scheduled on the drawings. Each supply register shall permit manual adjustments to the air flow by the occupants.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Comply with SMACNA (ASMM) for flashing/counter-flashing of roof penetrations and supports for roof curbs and roof mounted equipment.

C. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.

D. Install diffusers to ductwork with air tight connection.

E. Paint ductwork visible behind air outlets and inlets matte black, see Section 09 9123.

3.02 PROTECTION

A. Protect installed products until completion of project.

B. Replace, repair, or touch-up damaged products before Substantial Completion.

END OF SECTION

SECTION 23 3813
COMMERCIAL-KITCHEN HOODS

PART 2 PRODUCTS

1.01 HOOD APPLICATIONS

1.02 HOOD CONSTRUCTION

A. Provide products that comply with NFPA 96, the requirements and recommendations of SMACNA (KVS), and the requirements of the Authorities Having Jurisdiction.

B. Construction: Materials, inside and out, are stainless steel complying with ASTM A666, Type 304, stretcher leveled; unless otherwise indicated.
   1. Sheet Thickness: 18 gauge, 0.048 inch (1.22 mm), minimum.
   2. Fabrication: Fabricate each individual hood in one piece, with all welds ground and finished to match (inside and out); fabricate flat surfaces exposed to view as double-pan formed panels with internal stiffener members.
   3. Finish on Surfaces Exposed to View: No.4 (brushed directional); provide stainless steel faces on all sides exposed to view.
   4. Finish on Concealed Surfaces: No.4 or No.2B (dull, matte).
   5. Duct Collars: For exhaust and make-up air openings, provide duct collar welded to hood unit; minimum of 8 inches (200 mm) extension from top or back face of unit, with minimum one inch (25 mm) 90 degree flange, unless otherwise indicated.
   6. Access Panels: Provide removable or hinged access panels sufficient for maintenance and replacement of operating components inside unit; maximum width of 40 inches (1000 mm).
   7. Supports: Stainless steel mounting brackets, struts, and threaded hanger rods.
      a. Hanger Rods: 3/8 inch (9 mm) diameter, minimum.
      b. Hanger Spacing: 48 inches (1220 mm) on center, maximum.
      c. Attachment to Structure: Mechanical fittings or inserts, stainless steel.

1.03 HOOD ACCESSORIES

A. Controls:
   1. Fans: Provide manual push button controls for starting and stopping fans and labeled indicator lights showing fan status.
   2. Fans: Provide controls for fan operation by time clock, programmable by the week, capable of maintaining time cycle after operation of manual push buttons.

B. Control Panels: Factory assembled and pre-wired, ready for utility connections.
   1. UL listed for use with specific hood.
   2. Provide a single control panel combining all control functions for a particular hood, unless otherwise indicated.
   3. Provide a single control panel for each group of hoods served by a single exhaust fan.
   4. Enclosures: Flush-mounted; stainless steel, to match hood.
   5. Provide indicator lights on control panel door showing status of fans and power supply.

END OF SECTION

SECTION 23 7413
PACKAGED OUTDOOR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Packaged Dedicated Outside Air Roof Top unit.

B. Unit controls.

C. Remote panel.

D. Roof mounting curb and base.

1.02 RELATED REQUIREMENTS

A. Section 23 0548 - Vibration and Seismic Controls for HVAC.

B. Section 25 3519 - Integrated Automation Control Valves.

1.03 REFERENCE STANDARDS

A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2023.

B. AHRI 270 - Sound Performance Rating of Outdoor Unitary Equipment; 2015, with Addendum (2016).

C. ASHRAE Std 135 - A Data Communication Protocol for Building Automation and Control Networks; 2020, with Addendum (2024).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.

C. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

A. General: Roof mounted units having gas burner and electric refrigeration.

B. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, return fan, heat exchanger and burner, heat recovery coil, controls, air filters, refrigerant cooling coil and compressor, condenser coil and condenser fan.

C. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.

2.02 FABRICATION

A. Cabinet: Steel with baked enamel finish, including access panels with screwdriver operated flush cam type fasteners. Structural members shall be minimum 18 gauge, 0.0478 inch (1.21 mm), with access doors or panels of minimum 20 gauge, 0.0359 inch (0.91 mm).

B. Insulation: 1/2 inch (13 mm) thick neoprene coated glass fiber with edges protected from erosion.

C. Heat Exchangers: Aluminized steel, of welded construction.

D. Supply and Return Fan: Forward curved centrifugal type, resiliently mounted with V-belt drive, adjustable variable pitch pulley, and rubber isolated hinge mounted high efficiency motor or direct drive; see Section 23 0548. Isolate complete fan assembly.

E. Air Filters:
   1. 1 inch (25 mm) thick glass fiber disposable media in metal frames.

F. Roof Mounting Curb: 18 inches (350 mm) high galvanized steel, channel frame with gaskets, nailer strips.

2.03 BURNER

A. Gas Burner: Atmospheric type burner with adjustable combustion air supply, pressure regulator, gas valves, manual shut-off, intermittent spark or glow coil ignition, flame sensing device, and automatic 100 percent shut-off pilot.

B. Gas Burner Safety Controls: Energize ignition, limit time for establishment of flame, prevent opening of gas valve until pilot flame is proven, stop gas flow on ignition failure, energize blower motor, and after airflow proven and slight delay, allow gas valve to open.

2.04 EVAPORATOR COIL

A. Provide copper tube aluminum fin coil assembly with galvanized drain pan and connection.

B. Provide capillary tubes or thermostatic expansion valves for units of 6 Tons of refrigeration (21 kw) capacity and less, and thermostatic expansion valves and alternate row circuiting for units 7.5 Tons of refrigeration (26 kW) cooling capacity and larger.

2.05 COMPRESSOR

A. Provide hermetic compressors, 3600 rpm maximum, resiliently mounted with positive lubrication, crankcase heater, high and low pressure safety controls, motor overload protection, suction and discharge service valves and gauge ports, and filter drier.

2.06 CONDENSER COIL

A. Provide copper tube aluminum fin coil assembly with subcooling rows and coil guard.

B. Provide direct drive propeller fans, resiliently mounted with fan guard, motor overload protection, wired to operate with compressor. Provide high efficiency fan motors.

2.07 OPERATING CONTROLS

A. Provide low voltage, adjustable room thermostat to control burner operation, compressor and condenser fan, and supply fan to maintain temperature setting.
   1. Include system selector switch (heat-off-cool) and fan control switch (auto-on).

B. Provide terminal strip on unit for connection of operating controls to remote panel by others. Control shall allow for two stages of heating and two stages cooling.

C. BAS, SCADA, or other Integrated Automation Link: ASHRAE Std 135 BACnet MS/TP.

D. Control Valves: Field-installed, modulating, ball type with position tracking; see Section 25 3519.

2.08 ENERGY RECOVERY UNIT

A. Provide units with heat recovery.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that roof is ready to receive work and opening dimensions are as indicated on shop drawings.

B. Verify that proper power supply is available.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Mount units on factory built roof mounting curb providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level.

END OF SECTION

SECTION 23 7416
PACKAGED ROOFTOP AIR-CONDITIONING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Packaged, small-capacity, rooftop air-conditioning units.

B. Packaged, intermediate-capacity, rooftop air-conditioning units.

C. Packaged, large-capacity, rooftop air-conditioning units.

1.02 RELATED REQUIREMENTS

A. Section 23 0548 - Vibration and Seismic Controls for HVAC.

1.03 REFERENCE STANDARDS

A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2023.

B. AHRI 270 - Sound Performance Rating of Outdoor Unitary Equipment; 2015, with Addendum (2016).

C. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.

C. Manufacturer's Instructions: Indicate assembly, support details, connection requirements, and include start-up instructions.

D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect units from physical damage by storing off site until roof mounting curbs are in place and ready for immediate installation of units.

PART 2 PRODUCTS

2.01 PACKAGED, SMALL-CAPACITY, ROOFTOP AIR-CONDITIONING UNITS

A. General: Roof mounted units having gas burner and electric refrigeration that are 6 tons and smaller in capacity.

B. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, return fan, heat exchanger and burner, heat recovery coil, controls, air filters, refrigerant cooling coil and compressor, condenser coil and condenser fan.

C. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.

2.02 PACKAGED, INTERMEDIATE-CAPACITY, ROOFTOP AIR-CONDITIONING UNITS

A. General: Roof mounted units having gas burner and electric refrigeration that are 7.5 tons to 25 tons in capacity.

B. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, return fan, heat exchanger and burner, heat recovery coil, controls, air

filters, refrigerant cooling coil and compressor, condenser coil and condenser fan.

2.03 PACKAGED, LARGE-CAPACITY, ROOFTOP AIR-CONDITIONING UNITS

A. General: Roof mounted units having gas burner and electric refrigeration that are 25 tons and larger in capacity.

B. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, return fan, heat exchanger and burner, heat recovery coil, controls, air filters, refrigerant cooling coil and compressor, condenser coil and condenser fan.

2.04 CASING

A. Cabinet: Steel with baked enamel finish, including access panels with screwdriver-operated flush, cam type fasteners. Structural members to be minimum 18 gauge, 0.0478 inch (1.21 mm), with access doors or panels of minimum 20 gauge, 0.0359 inch (0.91 mm).

B. Insulation: 1/2-inch (13 mm) thick, neoprene-coated glass fiber with edges protected from erosion.

2.05 FANS

A. Supply and Return Fan: Forward curved centrifugal type, resiliently mounted with V-belt drive, adjustable variable pitch pulley, and rubber isolated hinge mounted. Provide with high efficiency motor or direct drive as indicated. Isolate complete fan assembly. See Section 23 0548.

2.06 BURNERS

A. Gas Burner: Atmospheric type burner with adjustable combustion air supply, pressure regulator, gas valves, manual shut-off, intermittent spark or glow coil ignition, flame-sensing device, and automatic 100 percent shutoff pilot.

B. Gas Burner Safety Controls: Energize ignition, limit time for establishment of flame, prevent opening of gas valve until pilot flame is proven, stop gas flow on ignition failure, energize blower motor, and after airflow proven and slight delay, allow gas valve to open.

2.07 EVAPORATOR COIL

A. Provide copper tube aluminum fin coil assembly with galvanized drain pan and connection.

B. Provide capillary tubes or thermostatic expansion valves for units of 6 tons (21 kw) capacity and less, and thermostatic expansion valves and alternate row circuiting for units 7.5 tons (26 kw) cooling capacity and larger.

2.08 CONDENSER COIL

A. Provide copper tube aluminum fin coil assembly with subcooling rows and coil guard.

B. Provide direct drive propeller fans, resiliently mounted with fan guard, motor overload protection, wired to operate with compressor. Provide high efficiency fan motors.

2.09 COMPRESSORS

A. Provide hermetic compressors, 3600 rpm maximum, resiliently mounted with positive lubrication, crankcase heater, high and low pressure safety controls, motor overload protection, suction and discharge service valves and gauge ports, and filter drier.

2.10 AIR FILTERS:

A. 1-inch (25 mm) thick, glass fiber disposable media in metal frames.

2.11 OPERATING CONTROLS

A. Provide low voltage, adjustable room thermostat to control burner operation, compressor and condenser fan, and supply fan to maintain temperature setting.
   1. Include system selector switch heat-off-cool and auto-on fan control switch.

B. Provide remote-mounted auto-on fan control switch.

2.12 ROOF CURBS

A. Roof Mounting Curb: 14 inches (350 mm) high, galvanized steel, channel frame with gaskets, nailer strips.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that roof is ready to receive work and opening dimensions are as required by manufacturer.

B. Verify that proper power supply is available.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Mount units on factory built roof mounting curb providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level.

3.03 SYSTEM STARTUP

A. Prepare and start equipment. Adjust for proper operation.

END OF SECTION

SECTION 23 8126.13
SMALL-CAPACITY SPLIT-SYSTEM AIR CONDITIONERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Air-source heat pumps.

B. Indoor air handling (fan and coil) units for ducted systems.

C. Controls.

1.02 RELATED REQUIREMENTS

A. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections and installation and wiring of thermostats and other controls components.

1.03 REFERENCE STANDARDS

A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2023.

B. ASHRAE Std 23 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Compressor Units; 2022.

C. NEMA MG 1 - Motors and Generators; 2021.

D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2021.

E. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.

F. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

PART 2 - PRODUCTS

2.01 SYSTEM DESIGN

A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
   1. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.

B. Performance Requirements: See Drawings for additional requirements.

C. Electrical Characteristics:
   1. Disconnect Switch: Factory mount disconnect switch on equipment under provisions of Section 26 0583.

2.02 INDOOR AIR HANDLING UNITS FOR DUCTED SYSTEMS

A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating and cooling element(s), controls, and accessories; wired for single power connection with control transformer.
   1. Air Flow Configuration: Upflow.
   2. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.

B. Supply Fan: Centrifugal type rubber mounted with direct or belt drive with adjustable variable pitch motor pulley.
   1. Motor: NEMA MG 1; 1750 rpm single speed, permanently lubricated, hinge mounted.
   2. Motor Electrical Characteristics:

C. Air Filters: 1 inch (25 mm) thick urethane, washable type arranged for easy replacement.

D. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
   1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.
   2. Manufacturers: System manufacturer.

2.03 OUTDOOR UNITS

A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
   1. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23 and UL 207.

B. Accessories: Filter drier, high-pressure switch (manual reset), low pressure switch (automatic reset), service valves and gauge ports, thermometer well (in liquid line).
   1. Provide thermostatic expansion valves.

C. Operating Controls:
   1. Control by room thermostat to maintain room temperature setting.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.

B. Verify that proper power supply is available and in correct location.

C. Verify that proper fuel supply is available for connection.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.

B. Install in accordance with NFPA 90A and NFPA 90B.

END OF SECTION

SECTION 26 0519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single conductor building wire.

B. Metal-clad cable.

C. Wiring connectors.

D. Electrical tape.

E. Oxide inhibiting compound.

F. Wire pulling lubricant.

G. Cable ties.

H. Firestop sleeves.

1.02 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

B. Section 26 0505 - Selective Demolition for Electrical: Disconnection, removal, and/or extension of existing electrical conductors and cables.

C. Section 26 0526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 28 4600 - Fire Detection and Alarm: Fire alarm system conductors and cables.

1.03 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011 (Reapproved 2017).

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).

E. ASTM B800 - Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes - Annealed and Intermediate Tempers; 2005 (Reapproved 2021).

F. ASTM B801 - Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy for Subsequent Covering or Insulation; 2018.

G. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.

H. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

I. NECA 104 - Standard for Installing Aluminum Building Wire and Cable; 2012.

J. NECA 120 - Standard for Installing Armored Cable (AC) and Type Metal-Clad (MC) Cable; 2018.

K. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.

L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

M. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

N. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

O. UL 267 - Outline of Investigation for Wire-Pulling Compounds; Current Edition, Including All Revisions.

P. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

Q. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

R. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

S. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
   3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

C. Wire Pulling Lubricant: Certification of compatibility with conductors/cables where used with the following insulation/jacket types:

D. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductors for Grounding and Bonding: Also comply with Section 26 0526.

H. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.

I. Conductor Material:
   1. Provide copper conductors except where aluminum conductors are specifically indicated or permitted for substitution. Conductor sizes indicated are based on copper unless specifically indicated as aluminum. Conductors designated with the abbreviation "AL" indicate aluminum.
      a. Substitution of aluminum conductors for copper is permitted, when approved by Owner and authority having jurisdiction, only for the following:
         1) Services: Copper conductors size 1/0 AWG and larger.
         2) Feeders: Copper conductors size 1/0 AWG and larger.
      b. Where aluminum conductors are substituted for copper, comply with the following:
         1) Size aluminum conductors to provide, when compared to copper sizes indicated, equivalent or greater ampacity and equivalent or less voltage drop.
         2) Increase size of raceways, boxes, wiring gutters, enclosures, etc. as required to accommodate aluminum conductors.
         3) Equip electrical distribution equipment with compression lugs for terminating aluminum conductors.
   2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
   3. Tinned Copper Conductors: Comply with ASTM B33.
   4. Aluminum Conductors (only where specifically indicated or permitted for substitution): AA-8000 series aluminum alloy conductors recognized by ASTM B800 and compact stranded in accordance with ASTM B801 unless otherwise indicated.

J. Minimum Conductor Size:
   1. Branch Circuits: 12 AWG.
      a. Exceptions:
         1) 20 A, 120 V circuits longer than 75 feet (23 m): 10 AWG, for voltage drop.
         2) 20 A, 120 V circuits longer than 150 feet (46 m): 8 AWG, for voltage drop.
         3) 20 A, 277 V circuits longer than 150 feet (46 m): 10 AWG, for voltage drop.
   2. Control Circuits: 14 AWG.

K. Conductor Color Coding:
   1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
   2. Color Coding Method: Integrally colored insulation.
      a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
   3. Color Code:
      a. 480Y/277 V, 3 Phase, 4 Wire System:
         1) Phase A: Brown.
         2) Phase B: Orange.
         3) Phase C: Yellow.
         4) Neutral/Grounded: Gray.
      b. 208Y/120 V, 3 Phase, 4 Wire System:
         1) Phase A: Black.
         2) Phase B: Red.
         3) Phase C: Blue.
         4) Neutral/Grounded: White.
      c. Equipment Ground, All Systems: Green.
      d. Isolated Ground, All Systems: Green with yellow stripe.

2.03 SINGLE CONDUCTOR BUILDING WIRE

A. Description: Single conductor insulated wire.

B. Conductor Stranding:
   1. Feeders and Branch Circuits:
      a. Size 10 AWG and Smaller: Stranded.
      b. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation:
   1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.

2.04 METAL-CLAD CABLE

A. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

B. Conductor Stranding:
   1. Size 10 AWG and Smaller: Solid.
   2. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

E. Provide dedicated neutral conductor for each phase conductor where indicated or required.

F. Grounding: Full-size integral equipment grounding conductor.

G. Armor: Steel, interlocked tape.

2.05 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Connectors for Grounding and Bonding: Comply with Section 26 0526.

2.06 ACCESSORIES

A. Electrical Tape:
   1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
   2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).

B. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.

C. Wire Pulling Lubricant:
   1. Listed and labeled as complying with UL 267.
   2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
   3. Suitable for use at installation temperature.

D. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install aluminum conductors in accordance with NECA 104.

D. Install metal-clad cable (Type MC) in accordance with NECA 120.

E. Installation in Raceway:
   1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
   2. Pull all conductors and cables together into raceway at same time.
   3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
   4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

F. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

G. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

H. Terminate cables using suitable fittings.
   1. Metal-Clad Cable (Type MC):
      a. Use listed fittings.
      b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.

I. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.

J. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

K. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

L. Make wiring connections using specified wiring connectors.
   1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
   2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
   3. Do not remove conductor strands to facilitate insertion into connector.
   4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
   5. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.

M. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

N. Insulate ends of spare conductors using vinyl insulating electrical tape.

O. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

P. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

Q. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

END OF SECTION

SECTION 26 0526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground bars.

E. Ground rod electrodes.

1.02 RELATED REQUIREMENTS

A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.

B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

C. Section 26 5600 - Exterior Lighting: Additional grounding and bonding requirements for pole-mounted luminaires.

1.03 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2022.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify exact locations of underground metal water service pipe entrances to building.
   2. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by NFPA 70 and product listing.

B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

D. Grounding System Resistance:
   1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.

2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.

E. Grounding Electrode System:
   1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
      a. Provide continuous grounding electrode conductors without splice or joint.
      b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
   2. Metal Underground Water Pipe(s):
      a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet (3.0 m) at an accessible location not more than 5 feet (1.5 m) from the point of entrance to the building.
      b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
      c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
   3. Metal In-Ground Support Structure:
      a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
   4. Ground Rod Electrode(s):
      a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
      b. Space electrodes not less than 10 feet (3.0 m) from each other and any other ground electrode.
   5. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
   6. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.
      a. Ground Bar Size: 1/4 by 2 by 12 inches (6 by 50 by 300 mm) unless otherwise indicated or required.
      b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.
      c. Ground Bar Mounting Height: 18 inches (450 mm) above finished floor unless otherwise indicated.
   7. Ground Riser: Provide common grounding electrode conductor not less than 3/0 AWG for tap connections to multiple separately derived systems as permitted in NFPA 70.

F. Service-Supplied System Grounding:
   1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
   2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.

G. Grounding for Separate Building or Structure Supplied by Feeder(s) or Branch Circuits:
   1. Provide grounding electrode system for each separate building or structure.
   2. Provide equipment grounding conductor routed with supply conductors.
   3. For each disconnecting means, provide grounding electrode conductor to connect equipment ground bus to grounding electrode system.
   4. Do not make any connections and remove any factory-installed jumpers between neutral (grounded) conductors and ground.

H. Separately Derived System Grounding:
   1. Separately derived systems include, but are not limited to:
      a. Transformers (except autotransformers such as buck-boost transformers).
      b. Uninterruptible power supplies (UPS), when configured as separately derived systems.
   2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.
   3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.
   4. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
   5. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.

I. Bonding and Equipment Grounding:
   1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
   2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
   3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
   4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
   5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
   6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
   7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
      a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
   8. Provide bonding for metal building frame.

J. Communications Systems Grounding and Bonding:
   1. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
      a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
      b. Raceway Size: 3/4 inch (21 mm) trade size unless otherwise indicated or required.
      c. Ground Bar Size: 1/4 by 2 by 12 inches (6 by 50 by 300 mm) unless otherwise indicated or required.

K. Pole-Mounted Luminaires: Also comply with Section 26 5600.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
   1. Provide products listed, classified, and labeled as suitable for the purpose intended.
   2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 0526:
   1. Use insulated copper conductors unless otherwise indicated.

a. Exceptions:
   1) Use bare copper conductors where installed underground in direct contact with earth.
   2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:
   1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
   2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
   3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

D. Ground Bars:
   1. Description: Copper rectangular ground bars with mounting brackets and insulators.
   2. Size: As indicated.
   3. Holes for Connections: As indicated or as required for connections to be made.

E. Ground Rod Electrodes:
   1. Comply with NEMA GR 1.
   2. Material: Copper-bonded (copper-clad) steel.
   3. Size: 3/4 inch (19 mm) diameter by 10 feet (3.0 m) length, unless otherwise indicated.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.

D. Make grounding and bonding connections using specified connectors.
   1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
   2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
   3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
   4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
   5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

E. Identify grounding and bonding system components in accordance with Section 26 0553.

END OF SECTION

SECTION 26 0529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

D. MFMA-4 - Metal Framing Standards Publication; 2004.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Comply with the following. Where requirements differ, comply with most stringent.
      a. NFPA 70.
      b. Requirements of authorities having jurisdiction.
   2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
   3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
   4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported with minimum safety factor of _____. Include consideration for vibration, equipment operation, and shock loads where applicable.
   5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
   6. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
      a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.
   1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
   2. Conduit Clamps: Bolted type unless otherwise indicated.

C. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.

D. Metal Channel/Strut Framing Systems:
   1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
   2. Comply with MFMA-4.

E. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.

F. Anchors and Fasteners:

1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.

END OF SECTION

SECTION 26 0533.13
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. Galvanized steel intermediate metal conduit (IMC).

C. Flexible metal conduit (FMC).

D. Liquidtight flexible metal conduit (LFMC).

E. Galvanized steel electrical metallic tubing (EMT).

F. Rigid polyvinyl chloride (PVC) conduit.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete encasement of conduits.

B. Section 07 8400 - Firestopping.

C. Section 26 0526 - Grounding and Bonding for Electrical Systems.
   1. Includes additional requirements for fittings for grounding and bonding.

D. Section 26 0529 - Hangers and Supports for Electrical Systems.

E. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

F. Section 26 2100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conduits.

G. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.

1.03 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2020.

B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.

C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit; 2018.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.

F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2017.

G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

H. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.

I. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.

L. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

M. UL 360 - Liquid-Tight Flexible Metal Conduit; Current Edition, Including All Revisions.

N. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

O. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

P. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

Q. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.
   3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
   4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
   5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:
   1. Where rigid polyvinyl chloride (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), or schedule 80 rigid PVC conduit where emerging from underground.

D. Exposed, Exterior, Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or stainless steel intermediate metal conduit (IMC).

2.02 CONDUIT - GENERAL REQUIREMENTS

A. Comply with NFPA 70.

B. Electrical Service Conduits: See Section 26 2100 for additional requirements.

C. Fittings for Grounding and Bonding: See Section 26 0526 for additional requirements.

D. Provide conduit, fittings, supports, and accessories required for complete raceway system.

E. Provide products listed, classified, and labeled as suitable for purpose intended.

F. Minimum Conduit Size, Unless Otherwise Indicated:
   1. Branch Circuits: 3/4-inch (21 mm) trade size.
   2. Branch Circuit Homeruns: 3/4-inch (21 mm) trade size.
   3. Control Circuits: 1/2-inch (16 mm) trade size.

G. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

B. Fittings:
   1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.04 GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC)

A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

B. Fittings:
   1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.05 FLEXIBLE METAL CONDUIT (FMC)

A. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.

2.06 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.

2.07 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use compression/gland or set-screw type.
      a. Do not use indenter type connectors and couplings.

2.08 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

B. Fittings:
   1. Manufacturer: Same as manufacturer of conduit to be connected.
   2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install conduit in accordance with NECA 1.

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Install intermediate metal conduit (IMC) in accordance with NECA 101.

E. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

F. Conduit Routing:
   1. Unless dimensioned, conduit routing indicated is diagrammatic.
   2. When conduit destination is indicated without specific routing, determine exact routing required.
   3. Conceal conduits unless specifically indicated to be exposed.
   4. Unless otherwise approved, do not route exposed conduits:
   5. Arrange conduit to maintain adequate headroom, clearances, and access.
   6. Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.

G. Conduit Support:
   1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 26 0529.
   2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
   3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
   4. Use conduit strap to support single surface-mounted conduit.
      a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
   5. Use metal channel/strut with accessory conduit clamps to support multiple parallel surface-mounted conduits.
   6. Use of wire for support of conduits is not permitted.

H. Connections and Terminations:
   1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
   2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
   3. Use suitable adapters where required to transition from one type of conduit to another.
   4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
   5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
   6. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
   7. Secure joints and connections to provide mechanical strength and electrical continuity.

I. Penetrations:
   1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
   2. Make penetrations perpendicular to surfaces unless otherwise indicated.
   3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
   4. Conceal bends for conduit risers emerging above ground.
   5. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.

6. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
7. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 07 8400.

J. Underground Installation:
1. Provide trenching and backfilling; see Section 31 2316.13.
2. Minimum Cover, Unless Otherwise Indicated or Required:
a. Underground, Exterior: 18 inches (460 mm).
b. Under Slab on Grade: 12 inches (300 mm) to bottom of slab.
3. Provide underground warning tape along entire conduit length for service entrance where not concrete-encased; see Section 26 0553.

K. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide minimum concrete cover of 3 inches (76 mm) on all sides unless otherwise indicated; see Section 03 3000.

L. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
3. Where conduits are subject to earth movement by settlement or frost.

M. Conduit Sealing:
1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
a. Where conduits enter building from outside.
b. Where service conduits enter building from underground distribution system.
c. Where conduits enter building from underground.
d. Where conduits may transport moisture to contact live parts.
2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
a. Where conduits pass from outdoors into conditioned interior spaces.
b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

N. Provide grounding and bonding; see Section 26 0526.

END OF SECTION

SECTION 26 0533.16
BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).

C. Floor boxes.

1.02 RELATED REQUIREMENTS

A. Section 08 3100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.

B. Section 26 0529 - Hangers and Supports for Electrical Systems.

C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 2726 - Wiring Devices:
   1. Wall plates.
   2. Floor box service fittings.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

I. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

J. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
   4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
   5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
   6. Coordinate the work with other trades to preserve insulation integrity.

7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.

C. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.

PART 2 PRODUCTS

2.01 BOXES

A. General Requirements:
1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
3. Provide products listed, classified, and labeled as suitable for the purpose intended.
4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
3. Use suitable concrete type boxes where flush-mounted in concrete.
4. Use suitable masonry type boxes where flush-mounted in masonry walls.
5. Use raised covers suitable for the type of wall construction and device configuration where required.
6. Use shallow boxes where required by the type of wall construction.
7. Do not use "through-wall" boxes designed for access from both sides of wall.
8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
12. Wall Plates: Comply with Section 26 2726.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA 250 Environment Type, Unless Otherwise Indicated:
3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
   a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

D. Floor Boxes:

1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 26 2726; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.
2. Use cast iron floor boxes within slab on grade.
3. Use sheet-steel or cast iron floor boxes within slab above grade.
4. Metallic Floor Boxes: Fully adjustable (with integral means for leveling adjustment prior to and after concrete pour).
5. Manufacturer: Same as manufacturer of floor box service fittings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

E. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

F. Box Locations:
1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 3100 as required where approved by the Architect.
2. Unless dimensioned, box locations indicated are approximate.
3. Locate boxes as required for devices installed under other sections or by others.
4. Locate boxes so that wall plates do not span different building finishes.
5. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
6. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
   a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.

G. Box Supports:
1. Secure and support boxes in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.

H. Install boxes plumb and level.

I. Flush-Mounted Boxes:
1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.

J. Install boxes as required to preserve insulation integrity.

K. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.

L. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

M. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

N. Close unused box openings.

O. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

P. Provide grounding and bonding in accordance with Section 26 0526.

END OF SECTION

SECTION 26 0548
VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vibration isolation requirements.

B. Seismic control requirements.

C. Vibration isolators.

D. External seismic snubber assemblies.

E. Seismic restraint systems.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

A. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 3000.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
   1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.

PART 2 PRODUCTS

2.01 VIBRATION ISOLATION REQUIREMENTS

A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing electrical equipment and/or electrical connections to vibration-isolated equipment.

B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:

C. General Requirements:
   1. Select vibration isolators to provide required static deflection.
   2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.

D. Equipment Isolation:
   1. Transformers:

a. Specified vibration isolators are in addition to any factory-installed internal core and coil assembly vibration isolators unless otherwise indicated.
b. Floor-Mounted Transformers, Seismic Applications: Use seismic type resilient material isolator mounts or seismic type restrained spring isolators.
c. Suspended Transformers, Seismic Applications: Use seismic type resilient material isolator hangers, seismic type spring isolator hangers, or seismic type combination resilient material/spring isolator hangers.
d. Wall-Mounted Transformers, Seismic Applications: Use seismic type resilient material isolator mounts.

E. Conduit Isolation:
1. Use flexible conduit or cable for electrical connections to vibration-isolated equipment, including equipment installed under other sections or by others.

END OF SECTION

SECTION 26 0553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Voltage markers.

E. Underground warning tape.

F. Warning signs and labels.

1.02 RELATED REQUIREMENTS

A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

B. Section 26 0573 - Power System Studies: Arc flash hazard warning labels.

C. Section 26 2726 - Wiring Devices - Lutron: Device and wallplate finishes; factory pre-marked wallplates.

D. Section 27 1000 - Structured Cabling: Identification for communications cabling and devices.

1.03 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:
   1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
      a. Switchboards:
         1) Identify ampere rating.
         2) Identify power source and circuit number. Include location when not within sight of equipment.
         3) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
      b. Panelboards:
         1) Identify ampere rating.
         2) Identify voltage and phase.
         3) Identify power source and circuit number. Include location when not within sight of equipment.
         4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
         5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
         6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
      c. Transformers:
         1) Identify kVA rating.
         2) Identify voltage and phase for primary and secondary.
         3) Identify power source and circuit number. Include location when not within sight of equipment.

4) Identify load(s) served. Include location when not within sight of equipment.
d. Enclosed switches, circuit breakers, and motor controllers:
1) Identify voltage and phase.
2) Identify load(s) served. Include location when not within sight of equipment.
e. Centralized Emergency Lighting Inverters:
1) Identify input and output voltage and phase.
2) Identify power source and circuit number for normal power source. Include location when not within sight of equipment.
3) Identify load(s) served. Include location.

2. Service Equipment:
a. Use identification nameplate to identify each service disconnecting means.
b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.

3. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
4. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
5. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
a. Service equipment.
b. Industrial control panels.
c. Motor control centers.
d. Elevator control panels.
e. Industrial machinery.
6. Arc Flash Hazard Warning Labels: Comply with Section 26 0573.

B. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 0519.
2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

C. Identification for Boxes:
1. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.

D. Identification for Devices:
1. Identification for Communications Devices: Comply with Section 27 1000.
2. Wiring Device and Wallplate Finishes: Comply with Section 26 2726.
3. Use identification label to identify fire alarm system devices.
a. For devices concealed above suspended ceilings, provide additional identification on ceiling tile below device location.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:
1. Materials:
2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.

B. Identification Labels:
1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.

2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

2.03 UNDERGROUND WARNING TAPE

A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

B. Non-detectable Type Tape: 6 inches (152 mm) wide, with minimum thickness of 4 mil (0.1 mm).

C. Legend: Type of service, continuously repeated over full length of tape.

D. Color:

2.04 WARNING SIGNS AND LABELS

A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B. Warning Signs:
1. Materials:
2. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.

C. Warning Labels:
1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

END OF SECTION

SECTION 26 0923
LIGHTING CONTROL DEVICES

PART 2 PRODUCTS

1.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

END OF SECTION

SECTION 26 0924
LIGHTING CONTROLS - LUTRON VIVE

PART 2 PRODUCTS

1.01 MANUFACTURERS

A. Basis of Design Manufacturer: Lutron Electronics Company, Inc; Vive; www.lutron.com/#sle.

1.02 LIGHTING CONTROLS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) as suitable for the purpose indicated.

B. Unless specifically indicated to be excluded, provide all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, programming, etc. as necessary for a complete operating system that provides the control intent indicated.

C. Design lighting control equipment for 10 year operational life while operating continually at any temperature in an ambient temperature range of 32 degrees F (0 degrees C) to 104 degrees F (40 degrees C) and 90 percent non-condensing relative humidity.

D. Electrostatic Discharge Tolerance: Design and test equipment to withstand electrostatic discharges without impairment when tested according to IEC 61000-4-2.

E. Power Failure Recovery: When power is interrupted for periods up to 10 years and subsequently restored, lights to automatically return to same levels (dimmed setting, full on, or full off) as prior to power interruption.

F. Wireless Devices:
   1. Wireless device family includes area or fixture level sensors, area or fixture level load controls for dimming or switching, and load controls that can be mounted in a wallbox, on a junction box, or at the fixture.
   2. Wireless devices including sensors, load controls, and wireless remotes or wall stations, can be set up using simple button press programming without needing any other equipment (e.g. central hub, processor, computer, or other smart device).
   3. Wireless hub adds the ability to set up the system using any smart device with a web browser (e.g. smartphone, tablet, PC, or laptop).
   4. System does not require a factory technician to set up or program the system.
   5. Capable of diagnosing system communications.
   6. Capable of having addresses automatically assigned to them.
   7. Receives signals from other wireless devices and provides feedback to user.
   8. Capable of determining which devices have been addressed.
   9. RF Range: 60 feet (18 m) line-of-sight or 30 feet (9 m) through typical construction materials between RF transmitting devices and compatible RF receiving devices.
   10. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B application.

G. Wireless Network:
   1. RF Frequency: 434 MHz; operate in FCC governed frequency spectrum for periodic operation; continuous transmission spectrum is not permitted.
      a. Wireless sensors, wireless wall stations and wireless load control devices do not operate in the noisy 2.4 GHz frequency band where high potential for RF interference exists.
      b. Wireless devices operate in an uncongested frequency band providing reliable operation.
      c. Fixed network architecture ensures all associated lights and load controls respond in a simultaneous and coordinated fashion from a button press, sensor signal, or command from the wireless hub (i.e. no popcorning).
   2. Distributed Architecture: Local room devices communicate directly with each other. If the wireless hub is removed or damaged, local control, sensing, and operation continues to function without interruption.

3. Local room devices communicate directly with each other (and not through a central hub or processor) to ensure:
   a. Reliability of system performance.
   b. Fast response time to events in the space (e.g. button presses or sensor signals).
   c. Independent operation in the event of the wireless hub being removed or damaged.

H. Device Finishes:
1. Standard Colors: Comply with NEMA WD 1 where applicable.
2. Color Variation in Same Product Family: Maximum delta E of 1, CIE L*a*b color units.
3. Visible Parts: Exhibit ultraviolet color stability when tested with multiple actinic light sources as defined in ASTM D4674. Provide proof of testing upon request.

END OF SECTION

SECTION 26 2100
LOW-VOLTAGE ELECTRICAL SERVICE ENTRANCE

PART 2 PRODUCTS

1.01 ELECTRICAL SERVICE REQUIREMENTS

A. Provide new electrical service consisting of all required conduits, conductors, equipment, metering provisions, supports, accessories, etc. as necessary for connection between Utility Company point of supply and service entrance equipment.

B. Products Furnished by Contractor: Comply with Utility Company requirements.

END OF SECTION

SECTION 26 2200
LOW-VOLTAGE TRANSFORMERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General purpose transformers.

B. K-factor transformers rated for nonlinear loads.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 26 0526 - Grounding and Bonding for Electrical Systems.

C. Section 26 0529 - Hangers and Supports for Electrical Systems.

D. Section 26 0533.13 - Conduit for Electrical Systems: Flexible conduit connections.

E. Section 26 0548 - Vibration and Seismic Controls for Electrical Systems.
   1. Includes requirements for the seismic qualification of equipment specified in this section.

1.03 REFERENCE STANDARDS

A. 10 CFR 431, Subpart K - Energy Efficiency Program for Certain Commercial and Industrial Equipment - Distribution Transformers; Current Edition.

B. IEEE C57.94 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers; 2015.

C. IEEE C57.96 - IEEE Standard Guide for Loading Dry-Type Distribution and Power Transformers; 2013.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

E. NECA 409 - Standard for Installing and Maintaining Dry-Type Transformers; 2015.

F. NEMA ST 20 - Dry Type Transformers for General Applications; 2021.

G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 506 - Standard for Specialty Transformers; Current Edition, Including All Revisions.

J. UL 1561 - Standard for Dry-Type General Purpose and Power Transformers; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Coordinate the work with placement of supports, anchors, etc. required for mounting.
   4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Include voltage, kVA, impedance, tap configurations, insulation system class and rated temperature rise, efficiency, sound level, enclosure ratings, outline and support point dimensions, weight, required clearances, service condition requirements, and installed features.

1. Vibration Isolators: Include attachment method and rated load and deflection.
2. K-factor Rated Transformers: Include K-factor ratings.

C. Manufacturer's equipment seismic qualification certification.

D. Project Record Documents: Record actual locations of transformers.

PART 2 PRODUCTS

2.01 TRANSFORMERS - GENERAL REQUIREMENTS

A. Description: Factory-assembled, dry type transformers for 60 Hz operation designed and manufactured in accordance with NEMA ST 20 and listed, classified, and labeled as suitable for the purpose intended.

B. Seismic Qualification: Provide transformers suitable for application under seismic design criteria in accordance with Section 26 0548 where required. Include certification of compliance with submittals.

C. Unless noted otherwise, transformer ratings indicated are for continuous loading according to IEEE C57.96 under the following service conditions:
1. Altitude: Less than 3,300 feet (1,000 m).
2. Ambient Temperature:
   a. Greater than 10 kVA: Not exceeding 104 degrees F (40 degrees C).
   b. Less than 10 kVA: Not exceeding 77 degrees F (25 degrees C).

D. Core: High grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Keep magnetic flux densities substantially below saturation point, even at 10 percent primary overvoltage. Tightly clamp core laminations to prevent plate movement and maintain consistent pressure throughout core length.

E. Impregnate core and coil assembly with non-hydroscopic thermo-setting varnish to effectively seal out moisture and other contaminants.

F. Basic Impulse Level: 10 kV.

G. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.

H. Isolate core and coil from enclosure using vibration-absorbing mounts.

I. Nameplate: Include transformer connection data, ratings, wiring diagrams, and overload capacity based on rated winding temperature rise.

2.02 GENERAL PURPOSE TRANSFORMERS

A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 506 or UL 1561; ratings as indicated on the drawings.

B. Insulation System and Allowable Average Winding Temperature Rise:
1. Less than 15 kVA: Class 180 degrees C insulation system with 115 degrees C average winding temperature rise.
2. 15 kVA and Larger: Class 220 degrees C insulation system with 150 degrees C average winding temperature rise.

C. Coil Conductors: Continuous aluminum windings with terminations brazed or welded.

D. Winding Taps:
1. Less than 3 kVA: None.
2. 3 kVA through 15 kVA: Two 5 percent full capacity primary taps below rated voltage.
3. 15 kVA through 300 kVA: Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.
4. 500 kVA and Larger: Two 2.5 percent full capacity primary taps above and two 2.5 percent full capacity primary taps below rated voltage.

E. Energy Efficiency: Comply with 10 CFR 431, Subpart K.

F. Sound Levels: Standard sound levels complying with NEMA ST 20

G. Mounting Provisions:

1. Less than 15 kVA: Suitable for wall mounting.
2. 15 kVA through 75 kVA: Suitable for wall, floor, or trapeze mounting.
3. Larger than 75 kVA: Suitable for floor mounting.

H. Transformer Enclosure: Comply with NEMA ST 20.
1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
2. Construction: Steel.
   a. Less than 15 kVA: Totally enclosed, non-ventilated.
   b. 15 kVA and Larger: Ventilated.
3. Finish: Manufacturer's standard grey, suitable for outdoor installations.
4. Provide lifting eyes or brackets.

I. Accessories:
1. Lug Kits: Sized as required for termination of conductors as indicated on the drawings.

2.03 K-FACTOR TRANSFORMERS RATED FOR NONLINEAR LOADS

A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 1561, and designed to supply nonlinear loads to the degree designated by the UL defined K-factor; ratings as indicated on the drawings.

B. K-factor Rating: K-4, or higher.

C. Insulation System and Allowable Average Winding Temperature Rise: Class 220 degrees C insulation system with 150 degrees C average winding temperature rise.

D. Coil Conductors: Continuous aluminum windings with terminations brazed or welded. Individually insulate secondary conductors and arrange to minimize hysteresis and eddy current losses at harmonic frequencies. Size secondary neutral conductor at twice the secondary phase conductor ampacity.

E. Winding Taps: Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.

F. Neutral Bus: Sized to accommodate twice the rated secondary current.

G. Energy Efficiency: Comply with 10 CFR 431, Subpart K.

H. Sound Levels: Standard sound levels complying with NEMA ST 20

I. Mounting Provisions:
1. Up to 75 kVA: Suitable for wall, floor, or trapeze mounting.
2. Larger than 75 kVA: Suitable for floor mounting.

J. Transformer Enclosure: Comply with NEMA ST 20.
1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
2. Construction: Steel, ventilated.
3. Finish: Manufacturer's standard grey, suitable for outdoor installations.
4. Provide lifting eyes or brackets.

K. Accessories:
1. Lug Kits: Sized as required for termination of conductors as indicated on the drawings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install transformers in accordance with NECA 409 and IEEE C57.94.

D. Use flexible conduit, under the provisions of Section 26 0533.13, 2 feet (600 mm) minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.

E. Arrange equipment to provide minimum clearances as specified on transformer nameplate and in accordance with manufacturer's instructions and NFPA 70.

F. Install transformers plumb and level.

G. Transformer Support:
   1. Provide required support and attachment in accordance with Section 26 0529, where not furnished by transformer manufacturer.
   2. Provide required vibration isolation and/or seismic controls in accordance with Section 26 0548.
   3. Use integral transformer flanges, accessory brackets furnished by manufacturer, or field-fabricated supports to support wall-mounted transformers.
   4. Unless otherwise indicated, mount floor-mounted transformers on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 03 3000.
   5. Use trapeze hangers assembled from threaded rods and metal channel (strut) to support suspended transformers. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

H. Provide grounding and bonding in accordance with Section 26 0526.

I. Remove shipping braces and adjust bolts that attach the core and coil mounting bracket to the enclosure according to manufacturer's recommendations in order to reduce audible noise transmission.

J. Where not factory-installed, install lugs sized as required for termination of conductors as indicated.

3.02 CLEANING

A. Clean dirt and debris from transformer components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 2416.23
PANELBOARDS - SCHNEIDER ELECTRIC SQUARE D I-LINE / QMB

PART 1 GENERAL

1.01 DEFINITIONS

A. Panelboards may also be identified as PP.

1.02 REFERENCE STANDARDS

A. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011 (Reaffirmed 2017).

B. ISO 9001 - Quality Management Systems — Requirements; 2015.

C. ISO 14001 - Environmental Management Systems — Requirements with Guidance for Use; 2015.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

E. NEMA PB 1 - Panelboards; 2011.

F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.

I. UL 67 - Panelboards; Current Edition, Including All Revisions.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Firm engaged in manufacture of specified products of types and sizes required, and whose products have been in satisfactory use in similar service for minimum of 50 years.
   2. Certified in accordance with ISO 9001 with applicable quality assurance system regularly reviewed and audited by third-party registrar. Develop and control manufacturing, inspection, and testing procedures under guidelines of quality assurance system.
   3. Service, repair, and technical support services available 24 hours per day, 7 days per week from manufacturer or their representative.
   4. Certified in accordance with ISO 14001, with product environmental profiles (PEPs) for specified products.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Prior to delivery to project site, verify suitable storage space is available to store materials in well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity, and corrosive atmospheres.

B. Protect materials during delivery and storage and maintain within manufacturer's written storage requirements. At minimum, store indoors in clean, dry space with uniform temperature to prevent condensation and protect electronics from potential damage from electrical and magnetic energy.

C. Deliver materials to project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and equipment tag number or service name as identified in Contract Documents.

D. Inspect products and report concealed damage or violation of delivery, storage, and handling requirements to Engineer.

1.05 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer warranty for defects in material and workmanship for 12 months from date of commissioning or 18 months from date of shipment, whichever comes first. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Schneider Electric; Square D I-Line Panelboard; www.se.com/#sle.

B. Source Limitations: Furnish products produced by same manufacturer as other electrical distribution equipment for project and obtained from single supplier.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

A. Comply with NEMA PB 1; listed and labeled as complying with UL 67.

B. Short Circuit Current Rating: Where not specified, provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

C. Provide panelboards marked for use as service equipment where required for application.

D. Markings and Labeling:
   1. Provide identification and warning labels/nameplates exterior to equipment resistant to weather, UV, and intended installation environment.
   2. Provide warning labels/nameplates complying with ANSI Z535.4 at access locations to advise personnel of possible hazards in accordance with listing, NFPA 70, NFPA 70E, and other applicable standards.
   3. Provide nameplates containing system information and catalog number or factory order number.
   4. Display interior wiring diagram, neutral wiring diagram, and short circuit current rating on interior or in booklet format.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install equipment in accordance with manufacturer’s written instructions.

B. Install panelboards in accordance with NECA 1 and NEMA PB 1.1.

C. Maintain proper phasing for multi-wire branch circuits.

3.02 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Manufacturer Services: Provide services of manufacturer's field representative to perform functional testing, commissioning, and first parameter adjusting.
   1. Include necessary material, equipment, labor, and technical supervision.
   2. Replace damaged or malfunctioning equipment and report discrepancies or installation issues.

C. Inspect complete installation for physical damage, proper alignment, anchorage, and grounding.

D. Measure steady state load currents at each panelboard feeder; rearrange circuits in panelboard to balance phase loads within 20 percent of each other.

E. Inspect tightness of bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver in accordance with manufacturer's written specifications.

3.03 PROTECTION

A. Protect installed panelboards from subsequent construction operations.

END OF SECTION

SECTION 26 2416
PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Power distribution panelboards.

B. Lighting and appliance panelboards.

C. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 26 0526 - Grounding and Bonding for Electrical Systems.

C. Section 26 0529 - Hangers and Supports for Electrical Systems.

D. Section 26 0548 - Vibration and Seismic Controls for Electrical Systems.

E. Section 26 2813 - Fuses: Fuses for fusible switches and spare fuse cabinets.

F. Section 26 4300 - Surge Protective Devices.

1.03 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendment (2017).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

E. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

F. NEMA PB 1 - Panelboards; 2011.

G. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

K. UL 67 - Panelboards; Current Edition, Including All Revisions.

L. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

M. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

N. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

O. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

C. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

PART 2 PRODUCTS

2.01 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet (2,000 m).
   2. Ambient Temperature:
      a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

C. Short Circuit Current Rating:
   1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

D. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
   1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
   2. Boxes: Galvanized steel unless otherwise indicated.
      a. Provide wiring gutters sized to accommodate the conductors to be installed.
   3. Fronts:
      a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
      b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
   4. Lockable Doors: All locks keyed alike unless otherwise indicated.

J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

K. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 26 4300, list and label panelboards as a complete assembly including surge protective device.

L. Multi-Section Panelboards: Provide enclosures of the same height, with feed-through lugs or sub-feed lugs and feeders as indicated or as required to interconnect sections.

M. Load centers are not acceptable.

2.02 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
   1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
   1. Phase and Neutral Bus Material: Aluminum.

2. Ground Bus Material: Aluminum.

D. Circuit Breakers:
1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.

E. Enclosures:
1. Provide surface-mounted enclosures unless otherwise indicated.
2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
3. Provide clear plastic circuit directory holder mounted on inside of door.

2.03 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
2. Phase and Neutral Bus Material: Aluminum.
3. Ground Bus Material: Aluminum.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:
1. Provide surface-mounted or flush-mounted enclosures as indicated.
2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
3. Provide clear plastic circuit directory holder mounted on inside of door.

2.04 OVERCURRENT PROTECTIVE DEVICES

A. Fusible Switches:
1. Description: Quick-make, quick-break, dead-front fusible switch units complying with NEMA KS 1, and listed and labeled as complying with UL 98; ratings, configurations, and features as indicated on the drawings.
2. Fuse Clips: As required to accept indicated fuses.
a. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.
3. Provide externally operable handle with means for locking in the OFF position. Provide means for locking switch cover in the closed position. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

B. Molded Case Circuit Breakers:
1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
2. Interrupting Capacity:
a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
3. Conductor Terminations:
a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
   a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
6. Provide the following circuit breaker types where indicated:
   a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
7. Do not use handle ties in lieu of multi-pole circuit breakers.
8. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.

PART 3 EXECUTION

3.01 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required support and attachment in accordance with Section 26 0529.

F. Provide required seismic controls in accordance with Section 26 0548.

G. Install panelboards plumb.

H. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

I. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.

J. Mount floor-mounted power distribution panelboards on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 03 3000.

K. Provide minimum of six spare 1 inch (27 mm) trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.

L. Provide grounding and bonding in accordance with Section 26 0526.

M. Install all field-installed branch devices, components, and accessories.

N. Provide fuses complying with Section 26 2813 for fusible switches as indicated.

O. Provide filler plates to cover unused spaces in panelboards.

P. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
   1. Emergency and night lighting circuits.
   2. Fire detection and alarm circuits.
   3. Communications equipment circuits.
   4. Intrusion detection and access control system circuits.

END OF SECTION

SECTION 26 2726
WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall switches.

B. Receptacles.

C. Wall plates and covers.

D. Floor box service fittings.

1.02 RELATED REQUIREMENTS

A. Section 26 0533.16 - Boxes for Electrical Systems.

1.03 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2014h (Validated 2022).

B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification); 2017g, with Amendment.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).

F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.

G. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

H. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

I. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

J. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

K. UL 1310 - Class 2 Power Units; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
5. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.
6. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

PART 2 PRODUCTS

2.01 WIRING DEVICE APPLICATIONS

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.

B. All wiring devices shall be Tamper-Resistant type.

C. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.

D. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.

E. Provide GFCI protection for receptacles installed within 6 feet (1.8 m) of sinks.

F. Provide GFCI protection for receptacles installed in kitchens.

G. Provide GFCI protection for receptacles serving electric drinking fountains.

2.02 WALL SWITCHES

A. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

B. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.03 RECEPTACLES

A. Receptacles - General Requirements: Tamper-Resistant, Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
   2. NEMA configurations specified are according to NEMA WD 6.

B. Convenience Receptacles:
   1. Tamper Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.
   2. Tamper Resistant and Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.

C. GFCI Receptacles:
   1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
   2. Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.
   3. Tamper Resistant and Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.

D. USB Charging Devices:
   1. USB Charging Devices - General Requirements: Listed as complying with UL 1310.
   2. USB Charging/Tamper Resistant Receptacle Combination Devices: Two-port (Type A) USB charging device and receptacle, commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; rectangular decorator style.

E. Locking Receptacles: Industrial specification grade, configuration as indicated on the drawings.

2.04 WALL PLATES AND COVERS

A. Wall Plates: Comply with UL 514D.
   1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.

2. Size: Standard; _____.
3. Screws: Metal with slotted heads finished to match wall plate finish.

B. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

C. Weatherproof Receptacle Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

2.05 FLOOR BOX SERVICE FITTINGS

A. Manufacturers:
1. Hubbell Incorporated; _____: www.hubbell.com/#sle.
2. Thomas & Betts Corporation; _____: www.tnb.com/#sle.
3. Wiremold, a brand of Legrand North America, Inc; _____: www.legrand.us/#sle.

B. Description: Service fittings compatible with floor boxes provided under Section 26 0533.16 with components, adapters, and trims required for complete installation.

C. Flush Floor Service Fittings:
1. Dual Service Flush Combination Outlets:
a. Cover: Rectangular.
b. Configuration:
1) Power: One standard convenience duplex receptacle(s) with outlet recessed in box with closed while in use opening(s).
2) Communications: _____.
3) Voice and Data Jacks: Provided by others.
2. Accessories:
a. Tile Rings: Finish to match covers; configuration as required to accommodate specified covers.
b. Carpet Flanges: Finish to match covers; configuration as required to accommodate specified covers.

PART 3 EXECUTION

3.01 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of wiring devices provided under this section.
1. Mounting Heights: Unless otherwise indicated, as follows:
a. Wall Switches: 48 inches (1200 mm) above finished floor.
b. Wall Dimmers: 48 inches (1200 mm) above finished floor.
c. Receptacles: 18 inches (450 mm) above finished floor or 6 inches (150 mm) above counter.
2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
4. Locate wall switches on strike side of door with edge of wall plate 3 inches (80 mm) from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.

F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.

I. Where split-wired duplex receptacles are indicated, remove tabs connecting top and bottom receptacles.

J. Install wiring devices plumb and level with mounting yoke held rigidly in place.

K. Install wall switches with OFF position down.

L. Do not share neutral conductor on branch circuits utilizing wall dimmers.

M. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

N. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

O. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

3.02 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect each wiring device for damage and defects.

C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.

D. Test each receptacle to verify operation and proper polarity.

E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

F. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.03 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

SECTION 26 2813
FUSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fuses.

B. Spare fuse cabinet.

1.02 REFERENCE STANDARDS

A. NEMA FU 1 - Low Voltage Cartridge Fuses; 2012.

B. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.
   2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.
   3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.
   1. Spare Fuse Cabinet: Include dimensions.

PART 2 PRODUCTS

2.01 FUSES

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.

C. Provide fuses of the same type, rating, and manufacturer within the same switch.

D. Comply with UL 248-1.

E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.

F. Voltage Rating: Suitable for circuit voltage.

G. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

H. Provide the following accessories where indicated or where required to complete installation:
   1. Fuseholders: Compatible with indicated fuses.
   2. Fuse Reducers: For adapting indicated fuses to permit installation in switch designed for fuses with larger ampere ratings.

2.02 SPARE FUSE CABINET

A. Description: Wall-mounted sheet metal cabinet with shelves and hinged door with cylinder lock, suitably sized to store spare fuses and fuse pullers specified.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.

B. Verify that mounting surfaces are ready to receive spare fuse cabinet.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Do not install fuses until circuits are ready to be energized.

B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

C. Install spare fuse cabinet where indicated.

END OF SECTION

SECTION 26 2816.13
ENCLOSED CIRCUIT BREAKERS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

B. Section 26 0529 - Hangers and Supports for Electrical Systems.

C. Section 26 0548 - Vibration and Seismic Controls for Electrical Systems.
   1. Includes requirements for the seismic qualification of equipment specified in this section.

1.02 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendment (2017).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

F. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

G. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

H. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

I. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for circuit breakers, enclosures, and other installed components and accessories.

C. Manufacturer's equipment seismic qualification certification.

PART 2 PRODUCTS

2.01 ENCLOSED CIRCUIT BREAKERS

A. Description: Units consisting of molded case circuit breakers individually mounted in enclosures.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Seismic Qualification: Provide enclosed circuit breakers and associated components suitable for application under the seismic design criteria specified in Section 26 0548 where required. Include certification of compliance with submittals.

D. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet (2,000 m).
   2. Ambient Temperature: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

E. Short Circuit Current Rating:

F. Enclosed Circuit Breakers Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

G. Conductor Terminations: Suitable for use with the conductors to be installed.

H. Provide electronic trip circuit breakers where indicated.

I. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.

J. Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.

K. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.
   2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.

L. Provide externally operable handle with means for locking in the OFF position.

M. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
   1. Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.

2.02 MOLDED CASE CIRCUIT BREAKERS

A. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.

B. Interrupting Capacity:
   1. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating.
   2. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

C. Conductor Terminations:
   1. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

D. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
   1. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
   2. Provide interchangeable trip units where indicated.

E. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
   1. Provide the following field-adjustable trip response settings:
      a. Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
      b. Long time delay.
      c. Short time pickup and delay.
      d. Instantaneous pickup.
      e. Ground fault pickup and delay where ground fault protection is indicated.

F. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

G. Provide the following features and accessories where indicated or where required to complete installation:
   1. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 26 0529.

E. Provide required seismic controls in accordance with Section 26 0548.

F. Install enclosed circuit breakers plumb.

G. Install flush-mounted enclosed circuit breakers so that trims fit completely flush to wall with no gaps and rough opening completely covered.

H. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed circuit breakers such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.

I. Provide grounding and bonding in accordance with Section 26 0526.

J. Set field-adjustable ground fault protection pickup and time delay settings as indicated.

3.02 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.03 CLEANING

A. Clean dirt and debris from circuit breaker enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 2816.16
ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed safety switches.

1.02 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

B. Section 26 0529 - Hangers and Supports for Electrical Systems.

C. Section 26 0548 - Vibration and Seismic Controls for Electrical Systems.

D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 26 2813 - Fuses.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

F. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

G. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

H. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

C. Manufacturer's equipment seismic qualification certification.

PART 2 PRODUCTS

2.01 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Seismic Qualification: Provide enclosed safety switches suitable for application under the seismic design criteria specified in Section 26 0548 where required. Include certification of compliance with submittals.

D. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet (2,000 m).
   2. Ambient Temperature: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).

E. Horsepower Rating: Suitable for connected load.

F. Voltage Rating: Suitable for circuit voltage.

G. Short Circuit Current Rating:
   1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

H. Enclosed Safety Switches Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

I. Provide with switch blade contact position that is visible when the cover is open.

J. Fuse Clips for Fusible Switches: As required to accept fuses indicated.
   1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.

K. Conductor Terminations: Suitable for use with the conductors to be installed.

L. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.

M. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

N. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.
   2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.

O. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

P. Heavy Duty Switches:
   1. Comply with NEMA KS 1.
   2. Conductor Terminations:
      a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 26 0529.

E. Provide required seismic controls in accordance with Section 26 0548.

F. Install enclosed switches plumb.

G. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.

H. Provide grounding and bonding in accordance with Section 26 0526.

I. Provide fuses complying with Section 26 2813 for fusible switches as indicated or as required by equipment manufacturer's recommendations.

J. Identify enclosed switches in accordance with Section 26 0553.

3.02 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.03 CLEANING

A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 3323
CENTRAL BATTERY EQUIPMENT

PART 2 PRODUCTS

END OF SECTION

SECTION 26 4300
SURGE PROTECTIVE DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surge protective devices for service entrance locations.

B. Surge protective devices for distribution locations.

C. Surge protective devices for branch panelboard locations.

1.02 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Include detailed component information, voltage, surge current ratings, repetitive surge current capacity, voltage protection rating (VPR) for all protection modes, maximum continuous operating voltage (MCOV), nominal discharge current (I-n), short circuit current rating (SCCR), connection means including any required external overcurrent protection, enclosure ratings, outline and support point dimensions, weight, service condition requirements, and installed features.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer's Warranty: Provide minimum five year warranty covering repair or replacement of surge protective devices showing evidence of failure due to defective materials or workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Factory-installed, Internally Mounted Surge Protective Devices:
   1. Same as manufacturer of equipment containing surge protective device, to provide complete listed assembly including SPD.

B. Source Limitations: Provide surge protective devices produced by single manufacturer and obtained from single supplier.

2.02 SURGE PROTECTIVE DEVICES - GENERAL REQUIREMENTS

A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service; listed, classified, and labeled as suitable for the purpose intended; system voltage as indicated on the drawings.

B. Unless otherwise indicated, provide field-installed, externally-mounted or factory-installed, internally-mouonted SPDs.

C. List and label as complying with UL 1449, Type 1 when connected on line side of service disconnect overcurrent device and Type 1 or 2 when connected on load side of service disconnect overcurrent device.

D. Protected Modes:

1. Wye Systems: L-N, L-G, N-G, L-L.

E. UL 1449 Voltage Protection Ratings (VPRs):
1. 208Y/120V System Voltage: Not more than 1,000 V for L-N, L-G, and N-G modes and 1,200 V for L-L mode.
2. 480Y/277V System Voltage: Not more than 1,500 V for L-N, L-G, and N-G modes and 2,000 V for L-L mode.

F. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.

G. Enclosure Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

2.03 SURGE PROTECTIVE DEVICES FOR SERVICE ENTRANCE LOCATIONS

A. Surge Protective Device:
1. Protection Circuits: Field-replaceable modular or non-modular.
2. Surge Current Rating: Not less than 120 kA per mode/240 kA per phase.
3. UL 1449 Nominal Discharge Current (I-n): 20 kA.
4. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.
5. Diagnostics:
a. Protection Status Monitoring: Provide indicator lights to report the protection for each phase.
b. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.

2.04 SURGE PROTECTIVE DEVICES FOR DISTRIBUTION LOCATIONS

A. Surge Protective Device:
1. Protection Circuits: Field-replaceable modular or non-modular.
2. Surge Current Rating: Not less than 80 kA per mode/160 kA per phase.
3. UL 1449 Nominal Discharge Current (I-n): 20 kA.
4. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.
5. Diagnostics:
a. Protection Status Monitoring: Provide indicator lights to report the protection status for each phase.
b. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.

2.05 SURGE PROTECTIVE DEVICES FOR BRANCH PANELBOARD LOCATIONS

A. Surge Protective Device:
1. Protection Circuits: Field-replaceable modular or non-modular.
2. Surge Current Rating: Not less than 60 kA per mode/120 kA per phase.
3. UL 1449 Nominal Discharge Current (I-n): 20 kA.
4. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.
5. Diagnostics:
a. Protection Status Monitoring: Provide indicator lights to report the protection status for each phase.
b. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.

PART 3 EXECUTION

3.01 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

C. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete in accordance with Section 26 0526 where applicable. Replace SPDs damaged by improper or missing neutral-ground bond.

END OF SECTION

SECTION 26 5100
INTERIOR LIGHTING

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 26 0529 - Hangers and Supports for Electrical Systems.

B. Section 26 0533.16 - Boxes for Electrical Systems.

1.02 REFERENCE STANDARDS

A. IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code); 1989 (Corrigendum 2019).

B. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2019.

C. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.

D. NECA/IESNA 500 - Standard for Installing Indoor Lighting Systems; 2006.

E. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

I. UL 1598 - Luminaires; Current Edition, Including All Revisions.

J. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
   2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
   3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
   4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
   1. LED Luminaires:
      a. Include estimated useful life, calculated based on IES LM-80 test data.
      b. Include IES LM-79 test report upon request.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide 5-year manufacturer warranty for LED luminaires, including drivers.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. LED Luminaires:
   1. Components: UL 8750 recognized or listed as applicable.
   2. Tested in accordance with IES LM-79 and IES LM-80.
   3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

H. LED Tape Lighting Systems: Provide all power supplies, drivers, cables, connectors, channels, covers, mounting accessories, and interfaces as necessary to complete installation.
   1. LED Tape - General Requirements:
      a. Listed.
      b. Designed for field cutting in accordance with listing.
      c. Wet Location Applications: IEC 60529, IP 68 (waterproof) rated.

2.03 EXIT SIGNS

A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.
   1. Number of Faces: Single- or double-face as indicated or as required for installed location.
   2. Directional Arrows: As indicated or as required for installed location.

PART 3 EXECUTION

3.01 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

D. Provide required support and attachment in accordance with Section 26 0529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Suspended Ceiling Mounted Luminaires:
   1. Do not use ceiling tiles to bear weight of luminaires.
   2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
   3. Secure surface-mounted and recessed luminaires to ceiling support channels or framing members or to building structure.

4. Secure pendant-mounted luminaires to building structure.
5. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
6. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gauge, connected from opposing corners of each recessed luminaire to building structure.
7. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

G. Recessed Luminaires:
1. Install trims tight to mounting surface with no visible light leakage.

H. Suspended Luminaires:
1. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
2. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet nominal length, with no more than 4 feet (1.2 m) between supports.
3. Install canopies tight to mounting surface.
4. Unless otherwise indicated, support pendants from swivel hangers.

I. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

J. Install accessories furnished with each luminaire.

K. Bond products and metal accessories to branch circuit equipment grounding conductor.

L. Exit Signs:
1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

M. Install lamps in each luminaire.

3.02 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.03 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 26 5600
EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior luminaires.

B. Poles and accessories.

C. Luminaire accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Materials and installation requirements for concrete bases for poles.

B. Section 26 0529 - Hangers and Supports for Electrical Systems.

C. Section 26 0533.16 - Boxes for Electrical Systems.

1.03 REFERENCE STANDARDS

A. IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code); 1989 (Corrigendum 2019).

B. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2019.

C. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

E. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2000 (Reaffirmed 2006).

F. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012 (Reaffirmed 2018).

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 1598 - Luminaires; Current Edition, Including All Revisions.

I. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.

1. LED Luminaires:
   a. Include estimated useful life, calculated based on IES LM-80 test data.
   b. Include IES LM-79 test report upon request.
2. Poles: Include information on maximum supported effective projected area (EPA) and weight for the design wind speed.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.

H. Recessed Luminaires:
   1. Ceiling Compatibility: Comply with NEMA LE 4.

I. LED Luminaires:
   1. Components: UL 8750 recognized or listed as applicable.
   2. Tested in accordance with IES LM-79 and IES LM-80.
   3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

J. LED Tape Lighting Systems: Provide all power supplies, drivers, cables, connectors, channels, covers, mounting accessories, and interfaces as necessary to complete installation.
   1. LED Tape - General Requirements:
      a. Listed.
      b. Designed for field cutting in accordance with listing.
      c. Wet Location Applications: IEC 60529, IP 68 (waterproof) rated.

2.03 POLES

A. All Poles:
   1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.

B. Metal Poles: Provide ground lug, accessible from handhole or transformer base.

PART 3 EXECUTION

3.01 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires in accordance with NECA/IESNA 501.

D. Provide required support and attachment in accordance with Section 26 0529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

G. Pole-Mounted Luminaires:
   1. Foundation-Mounted Poles:
      a. Provide cast-in-place concrete foundations for poles as indicated, in accordance with Section 03 3000.
         1) Install anchor bolts plumb per template furnished by pole manufacturer.
         2) Position conduits to enter pole shaft.
      b. Install foundations plumb.
      c. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
      d. Tighten anchor bolt nuts to manufacturer's recommended torque.
   2. Grounding:

a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.

3. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.

H. Install accessories furnished with each luminaire.

I. Bond products and metal accessories to branch circuit equipment grounding conductor.

J. Install lamps in each luminaire.

3.02 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

END OF SECTION

SECTION 27 05 34 PATHWAYS AND INFRASTRUCTURE FOR AV SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section describes and specifies infrastructure devices associated with Div. 274115 Performance Audio-Visual Systems and Equipment:

1.02 DESCRIPTION OF THE WORK

A. Conduit pathways

B. Backboxes, Junction Boxes, and Pull Boxes

C. AV Floor Boxes

D. Specialty Wall Box Covers

E. Cable support devices

1.03 SCOPE OF THE WORK

A. All Audiovisual Infrastructure devices listed in this Section shall be provided and installed by the Division 26 Electrical Contractor.

B. Conduit and containment pathways and terminations: Refer to associated AV-series Audiovisual Infrastructure drawings for conduit pathway scope, notes, and requirements.

C. All enclosures, as listed in the Audiovisual Device Legend sheets in the associated Audiovisual Infrastructure drawing packages, shall be furnished and installed by the Division 26 Electrical Contractor:

1. Specialty enclosures and / or Custom enclosure configurations are listed in this Specification Section.
2. Common enclosures and junction boxes are explicitly called out on Audiovisual Device Legend drawing sheet and are not restated here.

D. Audio-Visual Systems to be supplied under separate Section (27 41 15 Performance Audio-Visual Systems and Equipment).

1.04 RELATED DOCUMENTS

A. The general provisions of the contract, including General Provisions, Supplemental Conditions, and Division 1 – General Requirements, apply to the work specified in this section.

B. Refer to the associated AV-series Audiovisual Infrastructure drawings for additional information, notes, and exact locations pertaining to Infrastructure devices associated with Audiovisual Systems.

1.05 RELATED SECTIONS

A. Refer to Division 26 Electrical Drawings and Audiovisual AV-series drawings related to Division 26 electrical for coordination of conduits, pull wires, and connections to electrical power. All conduits, junction boxes, floor boxes and power are by Division 26. Refer to

Electrical drawings for all power, and all pathways associated with such power, for Audiovisual systems.

B. All conduits, junction boxes, and floor boxes associated with Audiovisual System devices shall be provided and installed by the Division 26 Electrical Contractor. Refer to AV-Series Audiovisual drawing sheets for all pathway requirements.

1.06 SUBSTITUTIONS

A. Refer to Division 1 for specific substitution procedures and submittal requirements.

B. Many items are listed in the Specifications by the manufacturer's type or model number, without a detailed performance specification, and may not include the phrase "or approved equal". Where this is the case, no substitutions will be accepted, without a written request from the Installer and the written consent of the Consultant and the Owner.

C. Where the phrase "or approved equal" appears, the item specified shall set a standard of quality and performance, based on the published specifications of the manufacturer and on the actual performance as known by the Consultant.

D. Requests for substitution, when forwarded by the Installer to the Consultant and Owner, are understood to mean that the Installer represents that he has personally investigated the proposed substitute product and determined that it is equal to or superior in all respects to that specified, that the same guarantee will be provided for the substitution as for the specified product, and that the Installer will coordinate the installation of the accepted substitute, making such changes as may be required for the work to be complete in all respects.

E. Substitutions will not be considered if they are indicated or implied in Shop Drawing submissions without previous formal request, or, for their implementation, they require a substantial revision of the Contract Documents in order to accommodate their use.

F. Space allocations and utility rough-ins have been designed on the basis of equipment items named by manufacturer and model number. If any equipment not so named is offered which differs substantially in dimension or configuration from the named equipment, provide scaled shop drawings showing that the substitute can be installed in the space available without interfering with other trades or with access for operation and maintenance in the completed project. The Installer shall coordinate final utility rough-in locations with actual equipment furnished.

G. Where substitute equipment requiring different arrangement or connections from those shown in the drawings is accepted by the Consultant, install the equipment to operate properly and in harmony with the intent of the Drawings and Specifications, making all necessary incidental changes without increasing the Contract amount. Pay all additional costs incurred by adjoining or connecting trades.

H. All requests for substitutions shall be submitted 2 weeks prior to the bid opening date. Substitutions shall be requested and approved in writing only, based upon these criteria.

1.07 COOPERATION AND COORDINATION

A. Cooperate and coordinate as required with the other contractors who are responsible for work not included in this section.

B. Provide any and all information as required or requested by the Owner, Architect/Engineer, Consultant, or General Contractor in order for this work to be completed to the satisfaction of

the Owner, and in the best interests of the Project. Such assistance or information shall be transmitted in writing to the requesting party in all cases. All written correspondence shall be copied to the Consultant.

1.08 GUARANTEE AND WARRANTY

A. Guarantee all parts, labor, and workmanship furnished under this contract for a period of twelve months from the date of substantial completion.

B. During the warranty period, report to the site and repair or replace any defective materials or workmanship without cost to the Owner. Warranty service shall be rendered within 48 hours after request by the Owner. Equivalent replacement equipment shall be temporarily provided when immediate on-site repairs cannot be made.

C. Where warranties on individual pieces of equipment exceed twelve months, the guarantee period shall be extended to the warranty period of the particular items.

1.09 SUBMITTALS

A. Equipment lists, data sheets, etc. shall be 8-½” x 11" size, properly bound into a single or multiple volumes as necessary, and also submitted in electronic PDF format. Submit quantity in accordance with Division 1, General Requirements.

B. Within 45 days after the notice to proceed, submit to the Architect/Engineer identical copies of the following for approval:

1. A complete equipment list, with manufacturers' names, model numbers, and quantities of each item;
2. Manufacturers' data sheets on all equipment items;
3. Floor plans and reflected ceiling plans, prepared at a scale not less than 1/8” = 1’-0”, showing device locations and orientation for all items in scope;
4. Riser diagrams showing conduit requirements, to include all pull boxes and outlet boxes;
5. Proposed construction details for all devices in this Specification Section. These details shall show dimensions, materials, finishes and color selection;

1.10 JOB CONDITIONS

A. Coordinate installation of mounts, back-boxes, floor boxes and all other devices specified in this Section with work of other trades.

PART 2 - PRODUCTS

2.01 GENERAL

A. All items shall be new and unused. The following articles specifically list the acceptable items for this project. Where quantities are not noted, they may be obtained from the associated drawings. In the event of a discrepancy between the specifications and the drawings, the greater quantity or better quality shall be furnished.

2.02 FLOOR BOXES

A. Furnish and install recessed floor boxes, as identified, at the locations indicated in the drawings.

B. Provide floor box enclosures and construction covers, as applicable, to Division 26 for

installation at each location.

C. Provide manufacturer's pour pans, as/if required by mounting location, for each floor box.

D. Boxes shall have a voltage divider or gang box knockout to allow for power receptacles and low-voltage AV connections to reside within the same box, where required. Conduits for high and low voltages must enter box on appropriate side of voltage divider to maintain separation. High and low-voltage wires may not cross within the box.

E. Provide lid / bezel type in accordance with scheduled finished floor type at each location. Finished installation shall provide for all lids flush with associated scheduled floor type. Verify lid types with Architect prior to shop drawings submittal.

F. Verify factory color / finish options for all floor box lid/bezel assemblies with Architect prior to shop drawings submittal. If directed by Architect, paint to match Architect's color sample.

G. Floor box insert connector plates to be provided and installed by Div. 27 41 15. Where insert plate(s) incorporate power receptacle(s), power shall be terminated by Div. 26.

H. Furnish and install the following, or approved equal:

1. Type "FB1": FSR Inc FL-500P-6-B 6-inch depth floor box with FL-500P-SLD-BLK-C Lid Assembly. The Installer shall verify enclosure and lid model variants with scheduled finished floor type, site conditions, and the Architect prior to product acquisition and use appropriate version for each location. (Qty: as shown)

2. Type "FB2": FSR Inc FL-500P-6-B 6-inch depth floor box with FL-500P-SLD-BLK-C Lid Assembly. The Installer shall verify enclosure and lid model variants with scheduled finished floor type, site conditions, and the Architect prior to product acquisition and use appropriate version for each location. (Qty: as shown)

2.03 SPECIALTY WALL BOX COVERS

A. Furnish and install locking wall box covers at the locations indicated in the drawings.

B. Specified devices shall mount directly to standard gang boxes at each location, in sizes as called out in the AV-Series drawing sheets Audiovisual Device Legend. Refer to mounting details and manufacturer instructions for specific mounting conditions and criteria.

C. All locking covers shall be keyed the same. Provide (5) sets of keys to the Owner.

D. Furnish and install the following, or approved equal, at locations indicated in the associated AV-series drawings:

1. Type 1: FSR WB-PR3G locking protective cover with window. (Qty: as shown)

2. Type C: FSR WB-TSC-SM-7 locking protective cover with window. (Qty: as shown)

2.04 CABLE SUPPORT DEVICES

A. Furnish and install cable support devices for use with routing Audiovisual cabling at Audiovisual equipment and production locations as shown.

B. Secure to wall and/or ceiling structure with appropriate hardware and fasteners, as required by wall and/or ceiling type.

C. Coordinate with other trades, as required, to eliminate interference and obstructions with other devices.

D. Coordinate penetrations at walls and partitions, as required. Provide fire-stop intumescent bags or other local / superseding code-approved fire-stop mechanisms at all required penetrations. Multiple fire-stop system shall be employed, as required, to equal the full capacity of the cable tray.

E. Furnish and install the following:

1. Ladder Rack: Hoffman LSS-12BLK, or approved equal, 1'-0" ladder rack system. Provide support brackets and all manufacturer-required hardware and accessories. (Qty: as required to support pathways shown)

PART 3 - EXECUTION

3.01 INSPECTION

A. Installer must examine substrates and conditions under which floor and wall mounted hardware and equipment enclosures are to be installed and notify the Consultant and Architect in writing of conditions detrimental to proper and timely completion of work.

3.02 INSTALLATION

A. Install the cable management trays, floor boxes, specialty enclosures and display wall boxes at the locations shown and in accordance with manufacturer's instructions. Install all devices level, plumb, secure and at the proper height. Cooperate with other trades to secure units to finished wall and floor surfaces. Repair and replace damaged items as directed by the Architect.

B. Coordinate layout of conduits, including specific routing and mounting elevations, with building structure and work of other trades.

C. Avoid crossing building expansion joints, to the extent possible. Where crossings occur, use expansion joints.

D. Provide a pull string in all raceways, cable trays, and conduits. Provide high tensile-strength pull lines in all conduits 4" and larger.

E. Installation of wall boxes back-to-back in opposite sides of a wall shall not be allowed. Allow a minimum of 2'-0" between boxes. At stud walls, provide a minimum separation of 1 stud cavity.

F. Provide protection for installed components so that all will be in perfect operating condition, without damage at completion of the project.

3.03 ADJUSTMENT AND CLEANING

A. Clean exposed surfaces of installed products.

B. Clean up all debris caused by work of this Section, keeping the premises neat and clean at all times.

END OF SECTION 27 05 34

SECTION 27 41 15 PERFORMANCE AUDIO-VISUAL SYSTEMS AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. Architectural, structural, mechanical, electrical, and other applicable documents and drawings are considered a part of the Performance Audio-Visual Systems and Equipment (hereafter referred to as AV Systems) documents insofar as they apply as if referred to in full.

1.02 DESCRIPTION OF THE WORK

A. The following systems are considered part of this project. The complete AV System for each area is comprised of several independent subsystems, and includes, but is not limited to the following areas:

1. Coordination of AV Systems needs with the electrical systems installation contractor as outlined in the Drawings and Specifications.
2. Coordination of AV Systems needs with structural systems installation contractor as outlined in the Drawings and Specifications.
3. Coordination of AV Systems needs with the technology/data systems installation contractor as outlined in the Drawings and Specifications.
4. Coordination of AV Systems needs with all other trades, as required to successfully install systems functioning in accordance with the intent expressed in the Drawings and Specifications.
5. Field-verify all conditions, dimensions, and routing. Fully comply with the Contract Documents, including, and without limitation, the need to check, confirm, and coordinate work with that of other disciplines.

6. Installation, configuration, and training for new Sound and AV systems and equipment as follows at the Auditorium:

    a. Sound reinforcement system, to include all supporting amplification.
    b. Digital Signal Processing system for use with preamplification, processing, and routing of audio sources, to include all supporting network devices and companion electronics.
    c. Bluetooth portable audio device connectivity.
    d. Digital mixing console.
    e. Back-of-house and Lobby AV monitoring systems, for stage monitoring.
    f. Wired and wireless production intercom system.
    g. Wired and Wireless Microphone systems.
    h. FM and Wifi Assistive listening systems for hearing-impaired accessibility.
    i. Video encoding and distribution devices.
    j. Video projection systems.

7. Installation, configuration, and training for new Sound and AV systems and equipment as follows at the Cafeteria:

    a. Sound reinforcement system, to include all supporting amplification.
    b. Digital Signal Processing system for use with preamplification, processing, and routing of audio sources, to include all supporting network devices and companion electronics.

c. Video encoder with Bluetooth portable audio device connectivity.
d. Wired and Wireless Microphone systems.
e. Video Wall

8. Loose equipment package including microphones, stands, and cables for flexible use throughout the facility.
9. Cable, connectors, wall plates, and other hardware and accessories, as required, to furnish a complete working system.

1.03 SCOPE OF THE WORK

A. These Specifications, together with the related drawings and General Conditions of the contract, comprise the requirements for the AV Systems for the project.

B. Furnish, deliver, erect, install and connect completely all of the material and appliances described herein and in the Drawings, and supply all other incidental material and appliances, tools, transportation, etc., required to make the work complete, and to leave the Sound Systems in first class operating condition, excluding those items listed under GENERAL, 1.10, RELATED WORK IN OTHER SECTIONS.

C. Perform all assembly of equipment, wiring and inter-connection and soldering of wires to jacks, devices, terminals or equipment, using technical employees only, who are experienced in the installation of AV equipment and its inter-connection. Coordinate final utility rough-in locations with actual equipment furnished.

D. Verify dimensions and conditions at the job site prior to installation, and perform installation in accordance with these Specifications, manufacturers' recommendations and all applicable code requirements.

1.04 QUALITY ASSURANCE

A. The intent of these Specifications is to describe and provide for complete AV Systems of high professional quality and reliability. Professional performance standards by the AV Systems Contractor (hereafter referred to as Installer) and the equipment will be required.

B. In all cases, the Owner and Consultant shall determine the acceptability of the work based upon the visits, observations, and reports of the AV Systems Consultant (hereafter referred to as Consultant).

1.05 SUBSTITUTIONS

A. Refer to Division 01 for specific substitution procedures and submittal requirements.

B. Many items are listed in the Specifications by the manufacturer's type or model number, without a detailed performance specification, and may not include the phrase "or approved equal". Where this is the case, no substitutions will be accepted.

C. Where the phrase "or approved equal" appears, the item specified shall set a standard of quality and performance, based on the published specifications of the manufacturer and on the actual performance as known by the Consultant. Requests for substitution shall be submitted in writing and forwarded to the Consultant no less than five (5) business days prior to the project’s scheduled bid date. No substitution will be accepted without written approval from the Consultant to the Installer.

D. Requests for substitution, when forwarded by the Installer to the Consultant, are understood

to mean that the Installer represents that he has personally investigated the proposed substitute product and determined that it is equal to or superior in all respects to that specified, that the same guarantee will be provided for the substitution as for the specified product, and that the Installer will coordinate the installation of the accepted substitute, making such changes as may be required for the work to be complete in all respects.

E. Substitutions will not be considered if they are indicated or implied in Shop Drawing submissions without previous formal request, or, for their implementation, they require a substantial revision of the Contract Documents in order to accommodate their use.

F. Space allocations and utility rough-ins have been designed on the basis of equipment items named by manufacturer and model number. If any equipment not so named is offered which differs substantially in dimension or configuration from the named equipment, provide scaled shop drawings showing that the substitute can be installed in the space available without interfering with other trades or with access for operation and maintenance in the completed project. The Installer shall coordinate final utility rough-in locations with actual equipment furnished.

G. Many Basis of Design products are specific as to infrastructure requirements, and such infrastructure has been specifically designed for the Basis of Design products listed. Where substitute equipment requiring different arrangement or connections from those shown in the Contract Documents is accepted by the Consultant, install the equipment to operate properly and in harmony with the intent of the Drawings and Specifications, making all necessary incidental changes without increasing the Contract amount. Facilitate revisions and modifications with impacted disciplines and trades, and pay all additional costs incurred by adjoining or connecting trades for implementation of such modifications.

H. All requests for substitutions shall be submitted five (5) business days before the bid opening date. Substitutions shall be requested and approved in writing only, based upon these criteria.

1.06 INSTALLER QUALIFICATIONS

A. The work performed under this Section shall be performed by an AV Systems Contractor, normally engaged in the business of AV Systems installation. The prospective AV Installer shall show proof, as part of the bid, that the contractor has been in the AV Systems installation business for a period of not less than five years and has successfully completed projects of similar size and scope.

B. Each prospective AV Installer shall provide comprehensive system portfolios of completed projects of comparable size and scope specific to Performing Arts applications for review by the AV Consultant.

C. The AV Installer’s Project Manager / Foreman shall hold current Avixa CTS-I certification.

D. Each bidder shall hold a current, valid franchise for the major lines of sound equipment furnished by him under these Specifications.

E. The Owner and Consultant reserve the right to reject any bids submitted by firms without sufficient experience in projects of similar size and scope.

1.07 COOPERATION AND COORDINATION

A. Cooperate and coordinate as shown with the other contractors who are responsible for work not included in this section.

B. Provide any and all information as shown or requested by the Owner, Consultant, or General Contractor in order for this work to be completed to the satisfaction of the Owner, and in the best interests of the Project. Such assistance or information shall be transmitted in writing to the requesting party in all cases. All written correspondence shall be copied to the Consultant.

1.08 GUARANTEE AND WARRANTY

A. Guarantee all parts, labor, and workmanship furnished under this contract for a period of twelve months from the date of substantial completion.

B. During the warranty period, report to the site and repair or replace any defective materials or workmanship without cost to the Owner. Warranty service shall be rendered within 24 hours after request by the Owner. Equivalent replacement equipment shall be temporarily provided when immediate on-site repairs cannot be made.

C. Where warranties on individual pieces of equipment exceed twelve months, the guarantee period shall be extended to the warranty period of the particular items.

D. Furnish complete and working AV Systems. Be of maximum assistance to the Owner during the guarantee period of the system, to the degree that maximum Owner satisfaction is assured.

E. After completion of the work, the Installer shall submit a Certificate of Warranty, stating commence and expiration dates and conditions of the warranty, for signature of both parties. Incremental warranties for completed portions of the work may be negotiated at the discretion of the Owner, if delays occur beyond the control of the Installer.

1.09 SHOP DRAWINGS AND SUBMITTALS

A. Completely detailed shop drawings shall be prepared prior to the procurement of equipment or commencement of work. Electronic files of select drawings will be made available to the Installer from the Consultant. A digital files disclaimer shall be signed and returned by the Installer to the Consultant prior to release of such files. The available drawings shall include only: (1) Legend/Power requirements, (2) Conduit Riser, (3) Floor and Reflected Ceiling Plans, (4) Section Views. Drawings shall be prepared and submitted in electronic format, and as directed by the Architect. Equipment lists, data sheets, etc. shall be 8-½” x 11" size, properly bound into a single electronic format file. Submit in accordance with Division 1, General Requirements.

B. Within 10 days after the notice to proceed, submit to the Consultant identical copies of the following for approval:

1. A complete equipment list, with manufacturers' names, model numbers, and quantities of each item.
2. Manufacturers' data sheets on all equipment items.
3. Equipment rack layouts showing locations of all rack mounted equipment items.
4. Floor plans and reflected ceiling plans, prepared at a scale of not less than 1/8”=1'-0", showing loudspeaker locations and orientation, junction box and wall plate locations, and all other related device locations.
5. Proposed construction details for any manufacturer-supplied, third party, and custom fabricated items, including interface panels, patch panels and patchbays, wall plates, speaker mounts and rigging details. These details shall show dimensions, materials, finishes and color selection.
6. Coordinate with the Architect / Owner regarding color selection of each equipment

item and associated mount / mounting hardware for any, and all, exposed devices. Provide factory color options for review in submittal package. The Installer shall request written confirmation from the Architect / Owner on all such devices prior to ordering. Where the Architect's color selection is not a factory color option, the Installer shall coordinate with the device manufacturer for custom color/paint, where available, and, if not available, coordinate with the General Contractor and other trades for field painting.

7. Comprehensive system schematics, showing detailed connections to all equipment, with wire numbers, terminal block numbers, and color coding.
8. Riser diagrams showing conduit requirements with pull boxes, outlet boxes, physical cable layouts, part numbers of cable types used, and number of circuits in each conduit.
9. Electrical power requirements for head-end and ancillary equipment. Include diagrams for any remote control of electrical power, in sufficient detail to coordinate with the electrical contractor, showing exact conduit requirements and locations for power service receptacles.
10. Certain other submittals as noted elsewhere in this specification, and as may be required for various equipment items prior to construction, fabrication, or finishing of that item.
11. Submission of the AV Contract Documents / Bid Documents does not constitute a legitimate submittal and will not be accepted.

C. Incomplete submittals will not be reviewed. Complete Shop Drawings and Product Data shall be submitted as a singular submittal.

D. All final documentation shall be submitted and approved before final acceptance by the Owner will be granted. Submit the following in accordance with Division 1, General Requirements. The Installer shall provide final documentation in both hard copy and electronic formats. Suitable electronic formats include Microsoft Word and Excel, AutoDesk (.dwg, .dwf), and Adobe Acrobat (.pdf)

1. A complete as-installed equipment list, listed by room, with manufacturers' names, model numbers, serial numbers, and quantities of each item.
2. A complete and correct system schematic, showing detailed connections for all parts of the system, including wire numbers, terminal block numbers and layouts, and other designations and codes. System performance measurements as noted elsewhere in this specification shall be documented. Include diagrams or charts showing final settings of all control knobs in the system (mixers, equalizers, power amplifiers, etc.). Submit copies of software settings of each piece of equipment that is software controlled.
3. Network configuration and routing settings for all network-connected equipment in scope including, but not limited to, the following:

    a. Full IP settings and addressing for each device.
    b. Network switch configurations, to include settings for VLANs, QoS, DiffServ, IGMP, and any other setting required for proper AV-network performance.
    c. Configuration and routing parameters for any Audio / AV-over-IP protocol, to include Dante, QLan, AES67, AVB, Milan, or any other standard protocol, variant, or proprietary communication platform.

4. Complete equipment rack layouts showing locations of all rack mounted equipment items.
5. Floor plans and reflected ceiling plans, prepared at a scale of not less than 1/8"=1'-0", showing loudspeaker locations and orientation, wall plates, rack locations, and other related device locations.
6. Riser diagrams showing as-installed conduit with pull boxes, outlet boxes, physical

cable layouts, part numbers of cable types used, and number of circuits in each conduit.

7. Repair parts lists for each and every major equipment item furnished.
8. Manufacturer's warranties and operating instructions for each and every equipment item furnished. Include a copy of the certificate of warranty, signed by both parties.
9. Technical Systems Operations Manual, custom-written by the Contractor, for the purpose of instructing the Owner's operating personnel in the detailed step-by-step operation of the system and preventive maintenance procedures. This manual shall include descriptions of the system components and their relationship to system function. This manual shall be bound separately and labeled appropriately.
10. Incomplete submittals will not be reviewed.

1.10 RELATED WORK IN OTHER SECTIONS

A. All conduit with pull strings, all electrical pull boxes, and all outlet boxes shall be furnished and installed under the electrical section of Division 26. Coordinate as necessary for proper installation.

B. All 120VAC power conductors and conduits associated with power circuits to all equipment locations shall be furnished and installed under the electrical section of Division 26. The 120VAC power to the equipment racks shall be terminated inside the racks to AV Installer-supplied isolated ground multi-circuit modular raceway receptacles.

C. An insulated THW stranded copper ground wire, sized according to NEC, shall be installed under the electrical section of Division 26 from the equipment racks sheet metal to the primary ground point within the building, and terminated at each end to bare metal using approved connectors and clamps.

D. All built-in millwork and any grille cloth shall be furnished under other sections.

E. Advisory electrical circuits shown in the AV System drawings are for reference only in depicting the number of electrical circuits needed for operation of these systems.

F. Advisory datacomm circuits shown in the AV System drawings associated with the building data network are for reference only in depicting the number of network drop locations needed for operation of these systems.

1. Datacomm circuits associated with the dedicated AV-NET data network are wholly within the AV Contractor’s scope of work, as specified in this Section and shown in the accompanying drawings.

G. Broadband signal feeds.

H. Satellite signal feeds and equipment.

PART 2 - PRODUCTS

2.01 GENERAL

A. All items shall be new and unused.

B. The following sections specifically list the acceptable equipment types and items for this project. Where quantities are not noted, they may be obtained from the drawings. In the event of a discrepancy between the specifications and the drawings, the greater quantity or better quality shall be furnished.

C. Refer to Part 1.5 SUBSTITUTIONS of this Specification Section.

2.02 WIRE & CABLE

A. All wire and cables shall be new and unused.

B. Wire not installed in equipment racks, not portable, or not installed in conduit shall be fire-rated and meet all applicable codes. Plenum-rated cable can only be used, if at all, in locations specified in the associated AV-series drawings. The systems contained in the system package are designed around standard PVC jacketed cable and EMT conduit.

C. Any and all exposed exterior cabling shall be UV rated.

D. Furnish and install the following, in quantities and lengths as required. Equivalent cable from other manufacturers may be considered.

E. Voice coil loudspeakers:

1. High frequency devices (bi/tri-amped systems only): West Penn 226 14AWG twisted pair.
2. Mid frequency devices and speaker monitor circuits (bi/tri-amped systems only): West Penn 227 12AWG twisted pair.
3. Low frequency and Full-Range devices: West Penn HA210 10AWG twisted pair.

F. Constant voltage (70.7-volt) loudspeaker cable:

1. Runs of less than 200 feet: West Penn 225 stranded 16AWG jacketed twisted pair.
2. Runs of 200’ to 300’: West Penn 226 stranded 14AWG jacketed twisted pair.
3. Runs of 300’ to 500’: West Penn 227 stranded 12AWG jacketed twisted pair.
4. Runs of 500’ or more: West Penn HA210 stranded 10AWG jacketed twisted pair.

G. Audio Cable:

1. Microphone-level audio cable (installed in conduit, not portable): West Penn Wire 452 stranded 22AWG twisted pair with foil shield.
2. Line-level audio cable and all inter-rack audio cable: West Penn Wire 452 stranded 22AWG jacketed twisted pair with foil shield.
3. Exterior and below-grade Microphone and Line level cable: West Penn AQ293 stranded 18AWG twisted pair with foil shield.

H. Production Intercom cable (installed in conduit, not portable):

1. 1-Channel: West Penn 293 stranded 18AWG twisted pair with foil shield.
2. 2-Channel: West Penn D440 2-pair stranded 18AWG twisted pair with individual foil shield per pair.
3. 4-Channel: West Penn D442 4-pair stranded 18AWG twisted pair with individual foil shield per pair.
4. Outdoor Production Intercom Cable (exposed directly to sunlight/weather or installed in conduit below grade): West Penn AQ293 stranded 18AWG twisted pair with foil shield.

I. Wireless microphone and RF Assistive Listening System antenna cable:

1. For runs less than 50 feet: Belden 9310, 50-ohm RG-58A/U coaxial cable with appropriate connectors.

2. For runs that exceed 50 feet: Belden 9914, 50-ohm RG-8A/U type coaxial cable with appropriate connectors.

J. Data cable (copper) for networked Audiovisual systems:

1. Installed Data cable: Panduit PUR6AV04*-G 23AWG Cat6a UTP, or approved equal conforming to project standard. * = color.
2. Data Patch cables: Panduit UTP28X*^ series 28AWG Cat6a UTP patch cables, or approved equal conforming to project standard. Provide in lengths required for applicable devices. * = length, ^ = color.

K. Fiber-Optic Cable for networked Audiovisual systems:

1. Panduit Opti-Core FOIRZ02Y 50µm OM4 2-strand Multimode Duplex Fiber Cable.

L. Other equipment control cables shall be stranded wire, appropriately shielded, of gauge and number of conductors required by the manufacturer for proper operation of the system or equipment item furnished.

M. Wire and cable for all other devices shall be supplied in accordance with the recommendations of the device manufacturer and the National Electrical Code.

2.03 JACKS, CONNECTORS, AND WALL PLATES

A. All plate-mounted connectors shall be ground-insulated from the plates on which they are mounted.

B. Floor-mounted jacks, unless noted otherwise, shall be installed in floor boxes. The interior plates shall be anodized black. Nomenclature shall be engraved into the interior plate of each floor box with 1/8” block letters filled with white paint. Coordinate floor box insert connector plates with actual floor boxes provided.

C. For non-standard custom panels, connectors shall be installed on 1/8” thick black anodized aluminum or brushed stainless steel panels. Nomenclature shall be engraved into the plate with 1/8” block letters filled with contrasting paint color. Coordinate final finish selection with Architect prior to Shop Drawing submittals.

D. All other jacks shall be installed on standard brushed stainless steel finish plates. Nomenclature shall be engraved into the plate with 1/8” block letters filled with black paint.

E. All AV signal circuit locations shall be numbered logically and consecutively for each circuit/signal type, starting from one (1).

F. All plate-mounted jacks at exterior locations shall be provided with captive sealing covers.

G. Unless otherwise specified, all jacks and connectors for the AV Systems shall be as follows, or approved equal:

1. Audio connectors:

a. Microphone and line-level input jacks (XLR type): Neutrik NC3FD-L-B-1 3-pin female XLR panel-mount jacks with gold-plated contacts.
b. Audio output jacks (XLR type): Neutrik NC3MD-L-B-1 3-pin male XLR panel-mount jacks with gold-plated contacts.

c. Production Intercom chassis mounted connectors: Neutrik NC6MSD-L-1 6-pin XLR Male conforming to Switchcraft pin configuration, or approved equal by Switchcraft.
d. Female cable-end audio connectors: Neutrik NC3FX-B 3-pin female XLR connectors with gold-plated contacts.
e. Male cable-end audio connectors: Neutrik NC3MX-B 3-pin male XLR connectors with gold-plated contacts.

2. Video and RF connectors:

a. BNC chassis mounted connector (75-Ohm): Neutrik NBB75DFIX Isolated UHD/4K BNC Bulkhead Jack.
b. BNC chassis mounted connector (50-Ohm): Amphenol Connex 112443 BNC Bulkhead Jack.
c. BNC cable mounted connector (75-ohm): Canare BCP-D series 12G-SDI 4K/UHD rated crimp cable connectors, model(s) sized for video cable type(s) provided.

3. Loudspeaker connectors:

a. Chassis mounted speaker connectors: Neutrik NL4MPXX 4-pole locking jack, or approved equal.
b. Cable mounted speaker connectors: Neutrik NL4FXX-W-* 4-pole locking plug, or approved equal. * = Provide model variant appropriate for cable O.D. for each assembly.

4. Network Data connectors:

a. CAT6A chassis mounted connector: Neutrik NE8FDX-Y6-B CAT6A Shielded Bulkhead Jack, Black with rear IDC terminations.
b. CAT6A chassis mounted connector (IP65 Rated): Neutrik NE8FDX-Y6-W CAT6A Shielded Bulkhead Jack, Black with rear IDC terminations, and integrated sealing cover. These devices are associated with any configuration at a non-conditioned or exterior location.
c. CAT6A cable connectors: Panduit FP6X88MTG Cat6a straight field term plug, or approved equal.

5. Fiber optic connectors:

a. Fiber optic chassis mounted connector: Neutrik OpticalCON DUO NO2-4FDW-A with duplex LC feedthrough socket and (4) solder contacts. Provide Neutrik SCNO-FDW-A captive sealing cover at each location.
b. Field-terminated fiber optic connectors shall not be accepted. Contractor shall fusion splice factory terminated duplex LC pigtails or patch cords of appropriate mode and wavelength to installed fiber optic cabling associated with AV System equipment.

6. Power Sequencing Remote Low-Voltage connectors:

a. Provide connectors for use with remote connections for power sequencing switch sets and standalone sequenced power modules. Connectors shall be in an industry standard form factor with an uncommon pin configuration to alleviate any mis-connection from standard audio, production intercom, or DMX systems.

b. Chassis-mount 4-pin XLR male: Neutrik NC4MD-L-B-1 4-pole male receptacle with gold contacts and black metal housing.
c. Chassis-mount 4-pin XLR female: Neutrik NC4FD-L-B-1 4-pole female receptacle with gold contacts and black metal housing.
d. Cable-mount 4-pin XLR male: Neutrik NC4MX-B 4-pole male cable connector with black metal housing and gold contacts.
e. Cable-mount 4-pin XLR female: Neutrik NC4FX-B 4-pole female cable connector with black metal housing and gold contacts.

7. Power connectors:

a. Chassis mounted: Neutrik NAC3MPX-TOP chassis-mounted power inlet connector.
b. Portable power cable assembly: 25-foot 12/3 SJO flexible power cable terminated in Neutrik NAC3FX-W-TOP at one end and 15-amp Edison plug (Nema 5-15 male) at the other.

H. Furnish and install the required number of jacks and connectors as indicated on the drawings.

2.04 EQUIPMENT RACKS

A. Furnish equipment racks for use in housing Audiovisual equipment including, but not limited to, power amplifiers, signal processors, input/output devices, playback equipment, intercom equipment, etc., and ancillary devices necessary to the operation of the system. Provide a ¼" (nominal) non-conductive industrial-grade black rubber mat under each floor-mounted cabinet trimmed to the footprint of the cabinet for isolation from building structure.

B. Each equipment rack shall include a locking front and rear doors, side panels, and top and bottom panels unless otherwise noted.

C. Equipment rack colors shall be flat black.

D. Heat-producing components shall be mounted with one RU blank panel installed between units, or as the manufacturer recommends. Fill all other unused portions of rack front sections with matching blank panels.

E. Furnish (5) sets of spare keys for each equipment rack.

F. All mounting screws shall be theft resistant.

G. Install the required number of units, of sufficient size to accommodate the equipment specified, at the locations indicated in the drawings.

H. At locations / systems with power sequencing, configure so that power amplifiers and active loudspeakers are the last to turn on in system power-up sequence and first to turn off in power-down sequence.

I. Furnish and install the following, or approved equal:

1. Floor Mounted Equipment Rack (ER): Middle Atlantic Products WRK-44SA-32 stand-alone equipment rack, to include rear door, FD-44 locking solid front door, WRK-RR-44 rear rack rail kit and MW-4QT-FC integrated fan top for each cabinet, as required. Provide all accessories as required for proper installation and support of all devices at each location. Provide (1) Middle Atlantic LT-GN-WL worklight for each

unit supplied. (Qty: 1 ea.)

2. Wall Mounted Equipment Rack (WR) at Cafeteria: Middle Atlantic Products DWR-24-26, to include FD-24 locking solid front door. (Qty: as shown)
3. AV Equipment Desk (DSK-A): HSA Rolltops INSEXT-II with PLUS4 4" additional height option and INSRKWIDE width accommodation option for slide out rotating rack at side equipment rack bay. Factory finish shall be black. Provide and install Middle Atlantic Products SRSR-4-16 16RU slide out rotating rack at side equipment rack bay. (Qty: 1 ea.)
4. Lighting Equipment Desk (DSK-L): HSA Rolltops INSEXT-D with PLUS4 4" additional height option. Factory finish shall be black. (Qty: 1 ea.)
5. Multi-circuit Power Sequencing at Auditorium:

    a. Power Sequencer Controller at "ER" Rack: Middle Atlantic Products USC-6R sequencing controller. Provide Middle Atlantic Products MPR series modular raceways at each rack with RLM-20IGA (20-amp sequenced isolated ground) and M-20IGA (20-amp non-sequenced isolated ground) power modules, and RLM-20-1CA (20-amp sequenced stand-alone modules for remote locations/equipment); provide configuration and all manufacturer accessories to support requirements shown on associated Advisory Audiovisual Power Requirements drawing sheet detail. Interface control contacts with AV control system for system power control via touch control screens. Coordinate with the Div. 26 Electrical Contractor for termination of 120VAC circuits associated with the power sequencing system raceway modules. Configure so that all power amplifiers are cycled off first and powered on last, in order to avoid transients/pops potentially harmful to loudspeakers. (Qty: as required)

6. Single-circuit Power Sequencing at Cafeteria:

    a. Middle Atlantic Products PDS-620R single-circuit sequenced power distribution unit. Interface control contacts with AV control system for system power control via touch control screens. Configure outlet sequence order so that amplifiers are turned on last and powered down first. (Qty: 1 ea.)

7. Rackmount Power Strip: Middle Atlantic PD-920R-NS. (Qty: as required to accommodate power for multiple rack mounted devices served from single power circuit at fixed rack locations)
8. Rackmount Power Strips with Retractable Front Light: Radial Engineering POWER-2. (Qty: as shown)
9. Brush Grommet Panel: Middle Atlantic BR1. (Qty: as shown)
10. Rack shelves:

    a. Middle Atlantic U1 1RU rack shelf. (Qty: as shown)
    b. Middle Atlantic U2 2RU rack shelf. (Qty: as shown)

11. Rack Blank Panels:

    a. Middle Atlantic BL1 1RU black brushed and anodized blank panel. (Qty: as shown)
    b. Middle Atlantic BL2 2RU black brushed and anodized blank panel. (Qty: as shown)

12. Rack Vent Panels:

a. Middle Atlantic VT1 1RU black powder coat vent panel with 64% open area. (Qty: as shown)
b. Middle Atlantic VT2 2RU black powder coat vent panel with 64% open area. (Qty: as shown)

13. Rack Drawers:

a. Middle Atlantic D3 3RU Rackmount Drawer. (Qty: as shown)

14. Rack Recessing Panels:

a. Middle Atlantic RR2-3RCN Rack Rail Recessor, 2 rack units (pair), 3” deep. (Qty: as shown)
b. Middle Atlantic CN1032-50 Cage Nuts for recessors (50-count). (Qty: as required)

2.05 DIGITAL SIGNAL PROCESSOR

A. The audio processing shall be in the digital domain following the input source and shall remain until power amplification is required.

B. The system processor shall provide up to 128 x 128 networked audio channels individually configurable as either Q-LAN or AES67 formatted networked audio. Networked audio channel count will reduce to 64 x 64 when using video bridging capability on the built-in USB Type-B Device port. Additionally, the system processor shall include 8 x 8 Software-based Dante network audio channels and is licensable for up to 32 x 32 Software-based Dante capacity. Software-based Dante channels used subtract from the overall 64 x 64 network audio capacity. The system processor shall support 24 total analog I/O capacity and shall be presented in the following groupings; 8 Mic/Line inputs, 8 Line outputs and 8 Flex Channel I/O which shall be software definable analog inputs or outputs in single channel increments in any combination ratio. The system processor shall be capable of connecting to any host PC, Mac or embedded device via USB and will present itself as up to four virtual external sound devices each offering Speakerphone (with or without Acoustic Echo Cancellation) or a Soundcard plus a single USB Webcam for Soft-Codec conferencing and other applications.

C. The system shall perform all of its real-time audio, video and control processing using Intel(r) processors running a purpose built, real-time Linux operating system developed by QSC, LLC. The system processor shall operate natively on a standard gigabit Ethernet infrastructure available from a broad range of network infrastructure manufacturers, employing DiffServ quality of service, IGMP, IEEE 1588-2008 (PTPv2) precision time protocol, UDP/IP audio and video transport with floating-point format audio data representation. The system shall support 802.1x authentication. The system shall not require IEEE 802.1AS, IEEE 802.1Qat, or IEEE 802.1Qav support on the network infrastructure to function. The overall system latency from analog input to synchronized analog outputs anywhere on the network shall be 3.167 mS. The system shall also be able to achieve an overall system latency of 3.167 mS over Layer-3 routed network infrastructure without any additional hardware, software or connection services between subnets.

D. The system processor shall manage external control interfaces such as Touchscreen Controllers, Paging Stations, Networked Audio I/O Expanders, Network Connected Amplifiers, AV-to-USB Bridging interfaces and IP-based PTZ Conference Room Cameras.

E. The system processor shall have the following front panel controls and indicators: Unit ID button, ID green LED, and Power On blue LED. A web interface shall provide basic network, services, and security configuration, status, and log retrieval. The system processor shall be

natively integrated into Q-SYS Designer Software for network discovery, real-time configuration, control, monitoring, supervision, and management.

F. On the rear panel, the system processor shall have one 3-pin RS232 Euro Block Connector, HDMI Video Out, RJ11 for POTS telephony, USB Type-B Device port to provide AV-to-USB Bridging capability. Q-SYS Network: LAN A RJ45 1000 Mbps only, LAN B: RJ45 1000 Mbps only.

G. The system processor shall offer up to 16 channels of built-in Acoustic Echo Cancelation at the default tail length of 200 mS which can optionally be configured via software for 100 mS, 300 mS or 400 mS tail length affecting minimum and maximum channel capacity on a linear sliding scale.

H. The system processor shall natively offer up to 4 Softphone instances assignable to the built-in network interface ports.

I. The system processor shall include support for up to 4 tracks of audio recording and 16 tracks of audio playback. Audio playback capacity may be expanded by field application of software licenses to expand this capacity to either 32 in combination with field-installable media drive expansion in available small, medium, or large options.

J. The system processor shall store, and operate from, a single design that shall be comprised of audio, video, and control components, wiring, links, text, and graphics on a single or multiple schematic pages. Designs shall include any of the following audio DSP, video, test and measurement components, control components, and layout components: Acoustic Echo Cancellers, Audio Players, Audio Streaming components, Crossfaders, Crossovers, Delay components, Auto Gain control elements, Compressors, Gates, Duckers, Expanders, Ambient Noise Compensators, Limiters, Gain blocks, Graphic Equalizers, Parametric Equalizers, FIR Filters, All-Pass Filters, Band-Pass Filters, Band-Stop Filters, High-Pass Filters, Low-Pass Filters, FIR High-Pass filters, FIR Low-Pass Filters, Dual-Shelf Equalizers, Notch Filters, Meters, Matrix Mixers, Gain-Sharing Automatic Mixers, Gated Automatic Mixers, Signal Routers, Public Address Routers, Room Combiners, Signal Presence Meters, SIP Softphone instances, Tone Generators, Noise Generators, Dual Trace FFT Measurement Modules, Real Time Analyzers, Signal Injectors, Signal Probes, Logic, Value and Position control functions, Lua scripting components, Command Buttons and Triggers, Camera Router, USB Audio Bridge, USB Video Bridge.

K. All network connections to be coordinated with the Owner’s network representatives. The Owner’s IT department to set-up static IP addresses in association with the Installer.

L. Provide all data interconnection cabling as shown.

M. Interface with control system and associated wired and wireless touch controllers (as specified elsewhere in this Section) for control of all required Audio DSP functions.

N. System programmer shall be QSys Level 2 certified or otherwise advanced manufacturer-certified for programming any respective approved substitute DSP product/system.

O. Include all licensing for DSP plug-ins and Dante™ routing by software, as required.

P. Furnish and install the following as indicated in the accompanying Audiovisual drawings, or approved equal:

1. Digital Signal Processor (DSP) at Auditorium: QSC Q-Sys CORE 110f V2. (Qty: as shown)

2. Digital Signal Processor (DSP) at Cafeteria: QSC Q-Sys CORE 8-Flex. (Qty: as shown)
3. Control input/output expander: QSC Q-Sys QIO-GP8x8. Provide QIO-RMK rackmount kit for mounting all QIO expander devices. (Qty: as shown)
4. Rackmount Touch Control Panel: QSC TSC-70-G3 7" touch control panel, to include mounting bracket. Mount on custom rack plate as shown. This device is associated with the portable Stage Manager Panel on stage. (Qty: as shown)
5. Desktop Touch Control Panel: QSC TSC-70-G3 7" touch control panel, to be supplied with TSC-710T-G3 desktop stand accessory. Desk mount at control booth sound operator position. (Qty: as shown)
6. Type "C" Touch Control Screen: QSC TSC-70-G3 7" touch control panel, to include mounting bracket. (Qty: as shown)
7. Network Switch: Netgear M4250-10G2XF-PoE+ (GSM4212PX) 10-Port switch with 8x 1G PoE+ RJ45 ports, 2x 1/10GbE SFP/SFP+ ports, 240W PoE+ power budget. (Qty: as shown)
8. Network Switch: Netgear M4250-26G4XF-PoE+ (GSM4230PX) 26-Port switch with 24x 1G PoE+ RJ45 ports, 2x 1/10GbE ports (Non-PoE+), 4x 1/10GbE SFP/SFP+ ports, 480W PoE+ power budget. (Qty: as shown)
9. Network Switch: Netgear M4300-52G-PoE+ (GSM4352PB) 52-Port switch with 48x 1G PoE+ RJ45 ports, 2x 1/10GbE ports (Non-PoE+), 2x 1/10GbE SFP/SFP+ ports, 591W PoE+ power budget. (Qty: as shown)
10. Multimode Transceivers for Network Switches: Netgear AXM761 10GBase-SR short reach 10G multimode transceiver with LC duplex connector for use with OM3/4 MM fiber. (Qty: as shown)
11. Type "AP" Wireless Access Point: Netgear WAX620 PoE-powered dual-band 802.11ax Wi-Fi access point. This device is dedicated to the AV system data network and is not associated with any building network functionality. (Qty: as shown)
12. Successful Contractor shall be responsible for programming each software configuration file for each system based on intended functionality shown, or implied, in the drawings.

    a. Each system shall be programmed so the default operating condition is auto-populated upon system power-up.
    b. Interface with the presentation and control system at each applicable space and program associated touch control panels for user control of all parameters necessary for successful control and operation of connected devices in each system.
    c. At locations where touch control screens are intended to be the mechanism by which system power is controlled, program touch control screens for this functionality, ensuring associated DSP, Control Processor, and Network Switch devices are powered from non-sequenced, non-switched power outlets.
    d. Terminate and program fire alarm interface at each system. Each system shall be programmed to mute all program audio upon receipt of contact closure from the addressable fire alarm module, provided by fire alarm vendor, at each system location.
    e. Contractor shall provide a review copy of the programming file to the Consultant for review at the latest four (4) weeks prior to scheduled commissioning trip.

2.06 LOUDSPEAKERS

A. The drawings indicate the loudspeaker positions and aiming points for each loudspeaker.

B. Loudspeakers shall be mounted to the structure, at the positions and angles indicated relative to the aiming points. Suspend each component with commercial rigging hardware, in such a

way as to facilitate minor angle adjustments. Safety factor shall be at least 5. Furnish rigging details during submittal process. Secure any loose hardware to prevent vibration and rattling. Orient each speaker at the location and angles indicated in the drawings. Make minor adjustments as required to provide even sound distribution.

C. Measure and record the impedance of each driver at the amplifier terminals. High frequency drivers shall be measured at 1000Hz; low frequency drivers shall be measured at 250Hz. Include the measurements in the final documentation.

D. For loudspeakers incorporating 70.7v transformers/autoformers, tap as indicated in the drawings.

E. Retain the services of a registered professional structural engineer licensed to practice in the State of project installation to develop mounting details, including attachment to the building structure. Structural information shall include design calculations and a copy of engineer's certification.

F. Verify factory color option selection with Owner / Architect prior to product acquisition.

G. Furnish and install the following assemblies, or approved equal:

1. Type "S1" Loudspeaker Arrays: ElectroVoice EVA series Expandable Vertical Array. Provide all rigging and manufacturer's mating and flying hardware, as required, for safe suspension at each location. Refer to drawings for configuration at each location. (Qty: 2 total loudspeaker arrays with separately hung subwoofers). Loudspeaker systems consist of one or more of the following components; refer to drawings for each array configuration:

    a. ElectroVoice EVA-2082S/906 dual 8" 2-way array module with 90°x6° dispersion.
    b. ElectroVoice EVA-2082S/920 dual 8" 2-way array module with 90°x20° dispersion.
    c. ElectroVoice EVA-2082S/1220 dual 8" 2-way array module with 120°x20° dispersion.
    d. ElectroVoice EVA-2151D dual 15" subwoofer.
    e. ElectroVoice EVA-EG Extended Rigging Grid.
    f. ElectroVoice EVA-GXB Extra Spreader Bar for rigging grids.

2. Type "S2" Loudspeaker: ElectroVoice EVF-1122S/96 12" loudspeaker with 90H°x60°V dispersion. To be supplied with EVF-UB mounting yoke. Mount in horizontal orientation and rotate horn, as required, for 90H°x60°V configuration. (Qty: as shown)
3. Type "S5" Loudspeaker: QSC AD-S8T 8" 70V loudspeaker with nominal 105° conical dispersion. For each unit supplied, provide YMS8T yoke mount. (Qty: as shown)
4. Type "S6" Loudspeaker: QSC SX300PIX 12" 70V loudspeaker with 65°H x 65°V dispersion. For each unit supplied, provide MB200 yoke mount. (Qty: as shown)

2.07 CEILING-RECESSED / PENDANT LOUDSPEAKER ASSEMBLIES

A. Furnish ceiling-recessed loudspeakers at the locations noted on the drawings.

B. Ceiling-recessed speakers shall be installed in a recessed enclosure, whether it be a separate back can or part of an integrated loudspeaker assembly. Furnish braces designed to provide additional support to the weight of the speaker and prevent tile sag. Coordinate

exact locations with the Owner. Connect the loudspeakers as indicated in the drawings. Furnish enclosures/back cans to Division 26 for installation if/where required.

C. Verify factory loudspeaker color with Architect prior to product acquisition. Baffles shall be painted a color selected by the Arch./Owner. Coordinate with the Architect regarding color selection.

D. Tap the transformers as indicated in the drawings. Measure and record the impedance at 1000Hz of each home run at the amplifier terminals. Include the measurements in the final documentation.

E. Furnish and install the following, or approved equal:

1. Type “S3”: Electrovoice EVID C6.2 6.5” 2-way 70v recessed ceiling speaker assembly. (Qty: as shown)
2. Type “S4”: Biamp Desono DP6 6” 2-way 70V suspended pendant speaker assembly. (Qty: as shown)

2.08 PORTABLE LOUDSPEAKERS

A. Furnish portable loudspeakers with accessories for flexible use.

B. Furnish the following, or approved equal, passive monitor speakers at the Auditorium:

1. JBL PRX412M 12-inch 2-way Stage utility / monitor speaker. (Qty: 6 ea.)
2. Whirlwind NL4-050 “speakon” speaker cable – 50 feet. (Qty: 6 ea.)
3. Whirlwind NL4-100 “speakon” speaker cable – 100 feet. (Qty: 2 ea.)

2.09 POWER AMPLIFIERS

A. Provide power amplifiers for use in amplifying audio signals for distribution to the loudspeakers.

B. Each power amplifier shall have an analog input connector which is either a screw-type barrier strip or XLR type. Networked amplifiers shall incorporate RJ-45 data jacks for network signal and/or control connectivity. Output connectors shall be either barrier strip or Neutrik Speakon connectors. Other types of connectors shall not be accepted. All power amplifiers shall have detented stepping input level controls. Install the units in the main equipment racks and connect as indicated in the drawings.

C. Provide (1) one amplifier channel for each loudspeaker home run. Size amplifier based on total power consumption of each home run. Locate amplifiers at sound equipment racks associated with each loudspeaker home run / zone.

D. Furnish and install the following, or approved equal:

1. 4-channel network amplifier compatible with specified DSP, 700 watts/ch max @ 8-Ohms and 70V: QSC CX-Q-2K4. (Qty: as shown)
2. 4-channel network amplifier compatible with specified DSP, 1,250 watts/ch max. @ 8-Ohms and 70V, 5,000 watts/ch max. @ 4-Ohms Bridged: QSC CX-Q-8K4. (Qty: as shown)
3. 8-channel network amplifier compatible with specified DSP, 1,000 watts/ch max. @ 8-Ohms, 4-Ohms, and 70V: QSC CX-Q-4K8. (Qty: as shown)
4. 8-channel network amplifier compatible with specified DSP, 625 watts/ch max. @ 16-Ohms, 1,250 watts/ch max. @ 8-Ohms and 70V, 1,500 watts/ch max. @ 4-Ohms:

QSC CX-Q-8K8. (Qty: as shown)

2.10 VOLUME CONTROLS

A. Furnish wall-mounted volume controls at locations indicated for use in controlling loudspeaker levels within each respective area.

B. Size each device per total speaker load at each respective location / zone.

C. Furnish and install the following, or approved equal:

1. Type “V”: Lowell Manufacturing **LVC-* 1-gang volume control (**=power rating, *=color). (Qty: as shown)

2.11 PLAYBACK, RECORDING, AND INTERFACE DEVICES

A. Furnish audio devices to facilitate the use of pre-recorded content or portable media, as well as for recording of program audio. Connect as indicated on the drawings.

B. Furnish and install the following, or approved equal:

1. CD/Media Player with Bluetooth, Aux, and USB inputs: Tascam CD-400U. (Qty: as shown)
2. Media Recorder: Denon DN-300R-MKII. For each unit supplied, provide (1) one Sandisk Extreme Pro USH-I SDXC 512GB SD Memory Card. (Qty: as shown)

2.12 MIXING CONSOLE

A. Furnish a mixing console for use in processing and routing microphone and line level sources.

B. Provide remote mixing capabilities with wireless tablet via the AV Network Wi-Fi.

C. The mixing console shall have the I/O specified and be configured on the built-in Dante network interface.

D. Configure the console prior to commissioning and provide configuration file to consultant for review.

E. Configure all Dante enabled devices, including wireless microphones and audio recorders, on the console.

F. Configure all routing of signal from console to DSP, via Dante into the Q-SYS platform.

G. Furnish and install the following at the Auditorium, or approved equal:

1. Digital Mixing Console: 120 mix channels, 48 mix and 12 matrix output busses, 32 in / 16 out local I/O, 24 + 4 master fader configuration, 144x144 Dante digital audio networking: Yamaha DM7. (Qty: 1 ea.)
2. I/O Rack: 32 analog input, 16 analog output, 8 AES/EBU digital outputs, Dante digital audio networking, remote head-amp control from specified mixing console: Yamaha Rio3224-D2. (Qty: 1 ea.)
3. I/O Rack: 16 analog input, 8 analog output, Dante digital audio networking, remote head-amp control from specified mixing console: Yamaha Rio1608-D2. (Qty: 1 ea.)
4. Wireless controller: Apple iPad Air 64GB Wifi model (verify color). To be provided

with Otterbox Defender Series Pro case compatible with tablet model supplied. (Qty: 1 ea.)

2.13 WIRELESS MICROPHONE SYSTEMS

A. Diversity UHF wireless microphone systems shall be used in this facility.

B. Operating frequency shall be as high as possible, and shall be selected so as to avoid interference.

C. The Contractor shall perform a Wireless Frequency Scan in order to determine the proper frequency selection for each venue.

D. Units are to be provided with rackmount kits, in the configurations shown in the accompanying drawings, and installed in equipment racks, whether fixed or portable racks, for use at each applicable venue.

E. Each system shall be provided on different frequencies so that they can be used simultaneously.

F. Furnish and install the following wireless systems and accessories, or approved equal, for production use at the Auditorium:

1. Shure ULXD4Q Quad-channel digital wireless receiver. (Qty: 6 ea.)
2. Shure ULXD2/SM58 Wireless handheld transmitter. (Qty: 8 ea.)
3. Shure ULXD1 Wireless bodypack transmitter. (Qty: 24 ea.)
4. Countryman E6 I-series* (* = B, T, C, LT) standard sensitivity omnidirectional earset microphone with TA4F connector. Verify with the Owner's representative for factory color selection – Black, Tan, Cocoa, or Light Tan. (Qty: 24 ea.)
5. Shure UA874US Active Directional Antenna, compatible with frequency range(s) of receivers supplied. (Qty: 2 ea.). Remote-mount at type "WL-A" antenna locations.
6. Shure UA845UWB Active Antenna Distribution Unit. (Qty: 2 ea.)
7. Shure SB900B Lithium-Ion rechargeable batteries. (Qty: 32 ea.)
8. Shure SBC800-US 8-Bay battery charging station, to include power supply. (Qty: 4 ea.)

G. Furnish and install the following wireless systems and accessories, or approved equal, for default / assembly use at the Auditorium:

1. Shure QLXD124/85 Combination System with QLXD4 digital wireless receiver, QLXD2/SM58 handheld transmitter, and QLXD1 bodypack transmitter. (Qty: 2 ea.). Remote-mount supplied ½-wave omni-directional antennas at type "WL-B" antenna locations.
2. Countryman E6 I-series* (* = B, T, C, LT) standard sensitivity omnidirectional earset microphone with TA4F connector. Verify with the Owner's representative for factory color selection – Black, Tan, Cocoa, or Light Tan. (Qty: 2 ea.)
3. Shure UA221 Passive Antenna Splitter Kit. (Qty: 1 ea.)
4. Shure SB900B Lithium-Ion rechargeable batteries. (Qty: 4 ea.)
5. Shure SBC200-US 2-Bay battery charging station, to include power supply. (Qty: 2 ea.)

H. Furnish and install the following wireless systems and accessories, or approved equal, for use at the Cafeteria:

1. Shure QLXD124/85 Combination System with QLXD4 digital wireless receiver,

QLXD2/SM58 handheld transmitter, and QLXD1 bodypack transmitter. Remote-mount supplied ½-wave omni-directional antennas at type “WL-C” antenna locations. (Qty: 2 ea.).

2. Countryman E6 I-series* (* = B, T, C, LT) standard sensitivity omnidirectional earset microphone with TA4F connector. Verify with the Owner’s representative for factory color selection – Black, Tan, Cocoa, or Light Tan. (Qty: 2 ea.)
3. Shure UA221 passive antenna splitter kit. (Qty: 1 ea.)
4. Shure SB900B Lithium-Ion rechargeable batteries. (Qty: 4 ea.)
5. Shure SBC200-US 2-bay battery charger with power supply. (Qty: 2 ea.)

2.14 PRODUCTION INTERCOM SYSTEM

A. Provide a production intercom system for use in voice communication and personnel coordination during events where indicated in the drawings.

B. Furnish intercom power supplies in sufficient quantities to accommodate all intercom devices per manufacturer’s specifications and recommendations for each system.

C. Refer to associated Audiovisual drawing package for all device, outlet, and equipment locations.

D. Furnish and install the following, or approved equal at the Auditorium:

1. Clear-Com MS-702 master intercom station. Furnish (1) GM-18 gooseneck microphone for each unit supplied. (Qty: 1 ea.)
2. Clear-Com PS-702 2-channel power supply. (Qty: 1 ea.)
3. Clear-Com RM-702 2-channel remote station. (Qty: 1 ea.)
4. Clear-Com KB-701 1-channel wall speaker station. These devices are associated with Type “IW” locations. (Qty: as shown)
5. Clear-Com RS-702 2-channel wired intercom belt pack. (Qty: 14 ea.)
6. Clear-Com CC-300 single muff intercom headset w/ flexible dynamic boom mic. (Qty: 14 ea.)
7. Clear-Com IC-25-2P 25-foot 6-pin XLR-F to XLR-M intercom cable, or approved equal from Whirlwind conforming to SwitchCraft 6-pin configuration. (Qty: 8 ea.)
8. Clear-Com IC-50-2P 50-foot 6-pin XLR-F to XLR-M intercom cable, or approved equal from Whirlwind conforming to SwitchCraft 6-pin configuration. (Qty: 6 ea.)
9. At surface mounted outlet locations at DSK-A and DSK-L control desks, provide and install FSR SMWB-1G-BLK surface mount wall box. Provide and install 1-gang 6-pin intercom plate at each location. (Qty: as shown)

2.15 ASSISTIVE LISTENING SYSTEMS

A. Furnish and install FM wireless assistive listening systems for use by the hearing-impaired. The assistive listening system (ALS) shall be capable of broadcasting on 57 channels and be frequency agile.

B. The receiver shall have a programmable multi-function Listen button that can be tuned for the venues desired channels and electronically lock out any unused channels. The receiver shall have a signal-to-noise ratio of 70 dB or greater and shall have an audio frequency response of 50 Hz - 15 kHz (±3 dB). The device shall employ a unique DSP SQTM noise reduction technology. The unit shall have a programmable squelch circuit. The unit shall incorporate a multi-functional display that indicates battery status, inventory number and channel. The device shall have the option of being lanyard or belt clip worn and the lanyard shall have the option of an integrated neck loop. The device shall have a USB connector used for inventory control, set up, charging and firmware upgrades. The device shall incorporate automatic

battery charging circuitry and use a non-proprietary lithium ion battery. The device shall have additional charging contacts to allow multiply charging options.

C. Supplemental transmission is provided via an assistive listening WiFi server distributed through the building WiFi wireless network. Personal reception is accomplished with a user-installed smartphone app, facilitating wireless connectivity to Bluetooth-enabled hearing aids.

D. Furnish and install the following installed systems, or approved equal, at the Auditorium:

1. Listen Technologies LS-55-216 iDSP Prime Level 3 Stationary RF System (216 MHz), to include (1) transmitter with rackmount kit, (4) rechargeable personal receivers, (4) intelligent Earphone/Neckloop lanyards, (4) universal ear speakers, 12-unit charging tray, ALS notification signage kit, and accessories. (Qty: 1 complete system)
2. Listen Technologies LA-124 90° Helical Antenna (216 MHz). Remote mount at “AL” location. (Qty: 1 ea.)
3. Listen Technologies LW-100P-02 2-channel WiFi server. Coordinate with the Owner’s IT staff for connection to building wireless network. (Qty: 1 complete system)

E. Furnish and install the following installed systems, or approved equal, at the Cafeteria:

1. Listen Technologies LS-55-216 iDSP Prime Level 3 Stationary RF System (216 MHz), to include (1) transmitter with rackmount kit, (4) rechargeable personal receivers, (4) intelligent Earphone/Neckloop lanyards, (4) universal ear speakers, 12-unit charging tray, ALS notification signage kit, and accessories. (Qty: 1 complete system)
2. Listen Technologies LA-124 90° Helical Antenna (216 MHz). Remote mount at “AL” location. (Qty: 1 ea.)

2.16 VIDEO / DATA PROJECTORS

A. Furnish and install high light output video projectors for projection of video, data, and graphic images on the projection screens in the areas as indicated.

B. Perform all setup procedures and image convergence for each input according to the manufacturer’s recommendations. The image shall be adjusted for full available screen width for each input.

C. Coordinate the exact location of the projector mount with the Architect and Project Manager/Designer. Provide exact location to ensure that the image fills the projection screen and all necessary details in shop drawings.

D. Provide all hardware as required for a complete mounting system, to include, but not be limited to, pipe extension columns, column accessories, and structural ceiling adaptors/mounts for suspension from structure above at suitable mounting height for proper alignment and imaging. Secure the projector to structure with anti-vibration mounts/devices at the location shown in the AV Drawings. Safety factor shall be at least five. Retain the services of a registered professional structural engineer licensed to practice in the State of installation to develop mounting details, including attachment to the building structure. Structural information shall include design calculations and a copy of engineer’s certification.

E. Verify factory color options for projector, mounting devices, and any required accessories with the Arch / Owner prior to ordering.

F. Provide with input modules, if/as required per projector model, to satisfy the requirements and connectivity shown in the associated drawings.

G. Projector models shall employ a laser-based light source.

H. Based on throw distance, screen size, and required lens option, the supplied projection system shall provide approximately 75 foot-lamberts at the screen.

I. Verify lens and screen photometrics in field prior to ordering.

J. Furnish and install the following, or approved equal:

1. Type VP-A Presentation Projector: Panasonic PT-RZ14KU 14K Lumen native WUXGA 3-chip DLP laser projector with ET-D3LET30 lens (2.88-5.61 throw ratio). Provide Chief CMA345 structural isolation mount, VCMU Heavy Duty Universal Projector Mount, HBU Universal Interface Bracket, and 1.5” NPT Column Extension in length(s) required. (Qty: 1 ea.)

2. Type VP-C Scenic Projector: Panasonic PT-RZ34KU 30K Lumen native WUXGA 3-chip DLP laser projector with ET-D75LE30 lens (2.4-4.66 throw ratio). Provide Chief CMA345 structural isolation mount, VCMU Heavy Duty Universal Projector Mount, HBU Universal Interface Bracket, and 1.5” NPT Column Extension in length(s) required. (Qty: 1 ea.)

2.17 PROJECTION SCREENS

A. Furnish and install all projection screens in the areas as indicated. Verify locations with architect prior to installation. Refer to architectural drawings for exact locations.

B. Install the projection screens only when clean and controlled environments are present.

C. Each screen to have a flat tensioned viewing surface. Surface to be held taut and wrinkle free, eliminating edge curl. The viewing surface shall be seamless.

D. All painting, metalwork, and woodwork shall be completed prior to installation, to protect against damage by other contractors.

E. The screens shall be delivered to the job site, still in factory crating, while access is still available for screens of these dimensions. Store the screens in such a way as to protect them from moisture and adverse weather conditions. Take all precautions necessary to protect the screens from damage during storage and installation. Projection screens must remain in a climate-controlled environment at all times.

F. Furnish and install the following, or approved equal:

1. Draper Stagescreen Complete System 226” Diagonal (120”H x 192”W) framed and tensioned projection screen in 16:10 aspect ratio with XT1000VB Matt White viewing surface. Provide frame in black finish. Provide all rigging and suspension hardware required for suspension from theatrical batten. Coordinate with Theatrical, as required. (Qty: 1 ea.)

2.18 FLAT PANEL DISPLAYS

A. Furnish commercial flat panel displays and associated mounting devices at locations and in configurations indicated for use with the video distribution system.

B. Coordinate with the Architect and Owner regarding exact locations and specific conditions.

C. Provide all cabling and mounting device accessories associated with each display type. Coordinate mounting at all locations, to include surface-mount and wall-recessed conditions.

D. Furnish specified devices at each and every location represented in the drawings.

E. Furnish and install the following, or approved equal:

1. Type TV-A: Samsung QB43C 43" 4K/UHD LED Display with Chief MTM1U Medium Tilt Wall Mount. Provide Chief Hardware Kit for each unit supplied. (Qty: as shown.)
2. Type TV-B: Samsung QB55C 55" 4K/UHD LED Display with Chief TS525TU Large Thinstall Dual Swing Arm Wall Mount. Provide Chief Hardware Kit for each unit supplied. (Qty: as shown)
3. Type TV-C: Samsung QB65C 65" 4K/UHD LED Display with Chief LTM1U Large Tilt Wall Mount. Provide Chief Hardware Kit for each unit supplied. (Qty: as shown.)
4. Dual rack monitor at portable Stage Manager Panel: Marshall Electronics ML-702-V2, to include power supply. (Qty: 1 ea.)

2.19 NETWORK MEDIA ENCODING AND DECODING

A. Furnish devices for use with encoding and decoding of Audiovisual signals over the dedicated AV-NET audiovisual data network. Devices shall support Gigabit Ethernet connectivity, and local DC or remote PoE+ power.

B. Devices shall support up to, and including, 4K and UHD video resolution with ultra-low latency and visually lossless video. HDMI 2.0 and HDCP 2.2 shall be supported.

C. System control shall be natively supported within the Audio DSP environment. Program Audio DSP system and associated touch control panel for individual encoder and decoder routing control to each endpoint location.

D. Program associated audio routing within the specified Audio DSP system for each space via software Media Stream Receiver and Media Stream Transmitter devices.

E. Furnish and install the following:

1. Wall Plate Media Encoder at type "1" locations: Visionary Solutions 5-Series E5-WP-BT-BLACK Wall Plate Video Encoder with Bluetooth Audio. (Qty: as shown)
2. Wall Plate Media Encoder at type "5" location: Visionary Solutions 5-Series E5-WP-BT-* Wall Plate Video Encoder. Verify color with Architect. (Qty: as shown)
3. Wall Plate Media Encoder at type "FB1" locations: Visionary Solutions 5-Series E5-WP-H-BLACK Wall Plate Video Encoder. (Qty: as shown)
4. Wall Plate Media Encoder at type "DSK-A" location: Visionary Solutions 5-Series E5-WP-H-BLACK Wall Plate Video Encoder. Provide and install FSR SMWB-2G-BLK surface mount wall box. (Qty: as shown)
5. Media Decoder at type "VP-A" Video Projector location: Visionary Solutions 5-Series D5100 Decoder. (Qty: as shown)
6. Media Decoder at type "VP-B" Video Projector location: Visionary Solutions 5-Series D5100 Decoder. (Qty: 1ea. at each projector)
7. Media Decoder at type "TV-A" Flat Panel Display locations: Visionary Solutions 5-Series D5100 Decoder. (Qty: as shown)
8. Media Decoder at type "TV-B" Flat Panel Display locations: Visionary Solutions 5-Series D5100 Decoder. (Qty: as shown).
9. Media Decoder at type "TV-C" Flat Panel Display locations: Visionary Solutions 5-

Series D5100 Decoder. (Qty: as shown)

10. Media Decoders at portable Stage Manager Panel: Visionary Solutions 5-Series D5100 Decoder. (Qty: as shown)
11. Media Encoder at type “ER” AV Equipment Rack: Visionary Solutions 5-Series E5100 Encoder. (Qty: as shown)
12. Rackmount Accessories: Provide Visionary Solutions AVIP-RACKMOUNT-3 rack kit and AVIP-BLNK-1 blanking plate, as required to support rackmount configurations shown. (Qty: as required)
13. NDI to HDMI Converter: Magewell ProConvert NDI-to-HDMI Decoder. Provide rack shelf and mount at type “ER” rack. (Qty: as shown)

2.20 VIDEO CAMERAS

A. Furnish a pan/tilt/zoom video camera for use in providing a reference video view to onstage, back of house, and lobby video displays.

B. Units shall provide simultaneous NDI and HDMI outputs. Devices shall be powered remotely via either PoE+ (IEEE802.af) or remote DC power supply.

C. Each unit shall be supplied with manufacturer’s mount or accessory housing, as specified.

D. Furnish and install the following at the Auditorium, or approved equal:

1. Type “CA” camera: Lumens VC-A61PN 4K NDI / HX PTZ Camera with VM12 wall mounting bracket. (Qty: as shown)

2.21 DIRECT-VIEW LED DISPLAYS

A. Installer to provide and install surface mounted LED display boards in the configurations as shown.

B. Display boards to be comprised of individual surface mounted diode modules manufactured for indoor use. Each cabinet segment comprising the LED display wall system to be secured together according to the manufacturers recommendations. Refer to audiovisual drawings for locations, sizes and quantities. Verify locations with architect.

C. LED boards to be mounted with manufacturer provided and designed mounting frame modules or mounting hardware. Coordinate with the General Contractor, as required, for sufficient blocking at each mounting location and flat wall mounting surface – this surface shall be flat within 1/8” across the entire mounting surface. Provide all hardware as required for a turn-key solution. Provide all hoisting and lifting equipment as required for a complete and functional system. Units to be convection cooled with no fans required.

D. A certified manufacturer representative shall commission the video wall displays to ensure proper installation, mounting, set-up and calibration. Representative to provide written certification once installation and commissioning is completed.

E. Pixel pitch shall be as specified for each display type and shall produce a maximum of 600 nits (cd/m2) of brightness. Viewing angles shall be 160 degrees horizontal and 140 degrees vertical. Shall have 4000:1 contrast ratio and an LED refresh rate of 3840 Hz.

F. Provide LED Display processing units, in quantities as required by configuration, and with Cat6 twisted pair delivery for each video board supplied. Units to have HDMI and DVI inputs and HDMI and DVI outputs for cascading and loop-through. Devices to have twisted pair outputs routed to the display and shall interface with third-party controller specified elsewhere

in this Section.

G. Each video board system shall include manufacturer onsite commissioning and training, manufacturer 3-year warranty and maintenance package, and spare parts package with servicing tool.

H. Furnish and install the following, or approved equal:

1. Planar MGP series display package, Quote # 00158404-1. Contact Fred Cain – fred.cain@planar.com for quote details and comprehensive parts list. Displays in this package consist of the following:

a. Type “VW” Video Board: Planar MGP 1.8mm, 9W x 9H module configuration (17.72’W x 9.97’H), to include display mounts and S6F video controllers. (Qty: 1 ea.)

2.22 MICROPHONES, STANDS, CABLE, AND DIRECT BOXES

A. Furnish microphones, stands, cables, and Direct Boxes for flexible use throughout the facility.

B. Each microphone shall be equipped with its own cable, with Neutrik connectors installed on each end.

C. Furnish and install the following at the Auditorium:

1. PTT Paging Microphone: Telex NC450D noise-cancelling dynamic push-to-talk paging microphone. Terminate to Neutrik NC3MRX right-angle XLR-male plug and install at portable Stage Manager Panel custom rack plate. Provide Magnetic Mic conversion kit (part# MMSU-1) and replace factory mounting clip for magnetic mounting at rack plate. Configure/program to address dressing rooms and scene shop with software ducker to duck associated program audio when paging is engaged. (Qty: as shown)
2. Recording Microphones at Catwalk “M3” location: AKG C451B reference small diaphragm cardioid condenser microphone. Provide Wilkinson ORTF-CLIP for stereo recording, Ace Backstage #43 Mic Hanger Slug, and suspend as indicated in associated drawing package. (Qty: 2 ea.)
3. Ambient Microphone at Catwalk “M3” location: Audix M1255B Mini Cardioid Condenser Microphone. Suspend as indicated in associated drawing package. (Qty: 1 ea.)
4. Suspended Choir Microphones over Stage: Audix M1255B Mini Cardioid Condenser Microphone. Coordinate with Owner’s representative for preferred locations. (Qty: 6 ea.)

D. Furnish the following loose items for flexible use at the Auditorium:

1. Crown/AKG PCC160 Phase-Coherent Cardioid boundary microphone. (Qty: 4 ea.)
2. Shure SM58-LC Cardioid Dynamic Vocal Microphone. (Qty: 2 ea.)
3. Shure SM57-LC Cardioid Dynamic Instrument Microphone. (Qty: 6 ea.)
4. Shure SM81 Cardioid Condenser Instrument Microphone. (Qty: 2 ea.)
5. Shure SM137 Cardioid Condenser Instrument Microphone. (Qty: 2 ea.)
6. Sennheiser MD421-II Large Diaphragm Cardioid Dynamic Instrument Microphone. (Qty: 2 ea.)
7. Atlas Sound DS-5E Desktop microphone stand, black. (Qty: 2 ea.)
8. Atlas Sound MS20E heavy duty microphone stand, black. (Qty: 12 ea.)
9. Atlas Sound PB21XEB adjustable boom with counterweight, black. (Qty: 6 ea.)

10. Atlas Sound TB3664 tripod microphone stand with boom, black. (Qty: 4 ea.)
11. Atlas Sound TB1930 short tripod microphone stand with boom, black. (Qty: 4 ea.)
12. Whirlwind MKQ25NP-BLACK 25-foot microphone cable. (Qty: 8 ea.)
13. Whirlwind MKQ50NP-BLACK 50-foot microphone cable. (Qty: 10 ea.)
14. Whirlwind MKQ100NP-BLACK 100-foot microphone cable. (Qty: 8 ea.)
15. Whirlwind L15 Leader 15-foot instrument cable. (Qty: 2 ea.)
16. Radial Engineering JDI passive direct box with Jensen transformer. (Qty: 1 ea.)
17. Radial Engineering PRO-AV2 passive stereo multimedia direct box. (Qty: 1 ea.)

E. Furnish the following loose items for flexible use at the Cafeteria:

1. Shure SM58-LC Cardioid Dynamic Vocal Microphone. (Qty: 2 ea.)
2. Atlas Sound TB3664 tripod microphone stand with boom, black. (Qty: 2 ea.)
3. Whirlwind MKQ25NP-BLACK 25-foot microphone cable. (Qty: 2 ea.)
4. Whirlwind MKQ50NP-BLACK 50-foot microphone cable. (Qty: 2 ea.)

PART 3 - GENERAL

3.01 INSTALLATION

A. Furnish components, racks, wire, cabinetry, connectors, materials, parts, equipment and labor necessary for the complete installation of the systems, in full accordance with the recommendations of the equipment manufacturers and the requirements of the drawings and specifications.

B. Installation shall follow standard broadcast wiring and installation practice, and shall meet or exceed industry standards for such work, with particular attention given to any installation instructions in Part 2 of these Specifications.

C. Equipment shall be held firmly in place with proper types of mounting hardware. All equipment affixed to the building structure must be self-supporting with a safety factor of at least three. All equipment shall be installed so as to provide reasonable safety to the operator.

D. All equipment shall be designed and rated for continuous operation and shall be UL listed, or manufactured to UL standards.

E. Observe proper circuit polarity and loudspeaker wiring polarity. No cables shall be wired with a polarity reversal between connectors with respect to either end. Special care shall be taken when wiring microphone cables, to ensure that constant polarity is maintained. Balanced audio connectors shall be wired as follows:

WIRE	CONNECTOR	SIGNAL
BLACK	PIN#3 or RING	LOW or NEGATIVE
RED or WHITE	PIN#2 or TIP	HIGH or POSITIVE
BARE	PIN#1 or SHIELD	GROUND

F. Provide all audio circuits balanced and floating, except as noted in the Specifications or directed by the Consultant at the time of final equalization and testing. Shields of audio cables shall be grounded at one end only, at the inputs of the various equipment items in the system.

G. Route cables and wiring within equipment racks and cabinetry according to function,

separating wires of different signal levels (video, microphone level, line level, amplifier output, 120VAC, intercom, control, etc.) by as much physical distance as possible. Neatly arrange and bundle all cables loosely with plastic cable ties. Cables and wires shall be continuous lengths without splices.

H. All system wire, except spare wire, after being cut and stripped, shall have the wire strands twisted back to their original lay and be terminated by approved soldered or mechanical means. No unterminated wire ends will be accepted. Heatshrink type tubing shall be used to insulate and dress the ends of all wire and cables. Include a separate tube for the ground or drain wire.

I. All cables in conduits shall be insulated from each other and from the conduit the entire length and shall not be spliced. All cables and wires are to be continuous lengths without splices.

J. All solder joints and terminations shall be made with resin-core silver solder.

K. Temperature regulated soldering irons rated at least 60 watts shall be used for all soldering work. No soldering guns or temperature unregulated irons shall be used on the job site.

L. Mechanical connections shall be made using approved connectors of the correct size and type for the connection. Wire nuts will not be accepted.

M. Each mechanical connector shall be attached using the proper size controlled-duty-cycle ratcheting crimp tool which has been approved by the manufacturer of the connectors. Conventional non-ratcheting type crimping tools are unacceptable, and shall not be used on the job site.

N. Label all wires in racks and console as to destination and purpose. Clearly and permanently label all jacks, controls, and connections, at the front and back of the rack, with permanent engraved laminated plastic labels or by engraving and filling mounting plates, unless otherwise noted. Attach laminated plastic labels with contact cement. Embossed or printed label tape, and press-on or lift-off lettering systems will not be accepted. All labeling shall be completed prior to final system inspection.

3.02 SOUND SYSTEMS FINAL TESTING AND EQUALIZATION

A. The completed AV Systems shall be physically inspected by the Consultant to assure that all equipment is installed in a neat and professional manner, and in accordance with this Section. The AV Systems shall be tested by the Consultant, BAi, Austin, TX. Contact BAi at 512-476-3464 at least 4 weeks in advance of requested check-out dates for scheduling. Provide jobsite photos, confirming substantial completion of the AV Systems, to the Consultant for review when requesting check-out dates.

B. The testing and equalization work shall be performed after the installation work has been completed, but prior to any use of the system.

C. During the testing and equalization work, the Installer shall have on the job site one (1) competent technician who is familiar with the project, and who will be prepared to stay as long as his services are needed. It is estimated that approximately eight (8) hours will be required for this work.

D. The process of equalizing and testing the system may necessitate moving and adjusting certain loudspeakers. Adjustments shall be performed without claim for additional payment.

E. Coordinate as necessary to ensure a totally quiet room during the AV Systems testing and balancing period.

F. Prior to requesting systems testing, verify the following:

1. All systems are in first-class working condition and free of short circuits, ground loops, parasitic oscillations, excessive system noise beyond published specifications of the equipment, hum, RF interference, or instability of any form.
2. All specified equipment is on the job site for proper accounting.
3. All loudspeaker circuits have been tested, are connected to the proper crossover frequency, and are in perfect working order. Furnish impedance measurements of each circuit prior to final tests.
4. All equipment controls are labeled, even if unused. If permanent labels cannot be furnished prior to system inspection, temporarily label every control as to its function with write-on tape. Supply labels or markers suitable for indicating knob settings after equalization is performed.
5. Operation manuals for every equipment item furnished are on hand at the job site.
6. Installer shall provide all signal processing software loaded on a portable PC and ready for use at time of testing. Installer shall provide a calibrated RTA and microphone, and pink noise generator at time of testing.

G. Should the performance testing show that the Installer has not properly completed the systems, the Installer shall make all necessary corrections or adjustments and a second demonstration shall be arranged at the Installer's expense.

H. The final acceptance of the system by the Owner will be based upon the report of the Consultant following inspection, testing, and demonstration. A list of items in need of completion or correction shall be generated by the Consultant, which must be corrected by the Installer before final acceptance will be granted.

3.03 SOUND SYSTEM PERFORMANCE

A. After equalization and testing, the sound system shall meet or exceed the following specifications:

1. System shall be free of short circuits, ground loops, parasitic oscillation, excessive system noise, hum, RF interference, and instability of any form.
2. Maximum SPL with band-limited pink noise input to the system shall be:

a. Auditorium: Maximum SPL with band-limited pink noise / program material input to the system shall be 93 dB before audible distortion occurs, spatial variation +/- 3dB at 4kHz, frequency response uniform to +/- 2 dB, 32 Hz to 16 kHz.

3.04 OWNER TRAINING AND FAMILIARIZATION

A. The Installer shall furnish the Owner's representatives with training necessary to properly operate the systems. Demonstrate in detail all functions of the systems. Provide a minimum of eight (8) hours of instruction and familiarization for this purpose. These training sessions shall be videotaped by the Installer and copies provided to the Owner with the as-built documentation.

B. The Installer shall attend one scheduled event, as selected by the Owner, to assist and troubleshoot, as necessary, in initial user operation of these systems.

SECTION 13850 (28 31 00)

FIRE ALARM SYSTEM

Product Guide Specification

Specifier Notes: This product guide specification is written according to the Construction Specifications Institute (CSI) 3-Part Format as described in *The Project Resource Manual—CSI Manual of Practice.* The section must be carefully reviewed and edited by the Architect or Engineer to meet the requirements of the project and local building code. Coordinate this section with other specification sections and the Drawings. Delete all "Specifier Notes" when editing this section.

Section numbers and titles are from *MasterFormat* 1995 Edition, with numbers and titles from *MasterFormat* 2004 Edition in parentheses. Delete version not required.

SECTION 13850 (28 31 00)

FIRE ALARM SYSTEM

Specifier Notes: This section covers Honeywell | Gamewell-FCI E3 Series Expandable Emergency Evacuation Fire Alarm System. Consult Honeywell | Gamewell-FCI for assistance in editing this section for the specific application.

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Emergency evacuation fire alarm system.

1.2 RELATED SECTIONS

Specifier Notes: Edit the following list of related sections as required for the project. List other sections with work directly related to this section.

A. Section 13800 – Building Automation and Control.

B. Section 13900 (21 00 00) – Fire Suppression.

C. Section (27 15 00) – (Communications Horizontal Cabling).

1.3 REFERENCES

Specifier Notes: List standards referenced in this section, complete with designations and titles. This article does not require compliance with standards, but is merely a listing of those used.

A. Electrical Industries Association (EIA):
   1. RS-232-D – Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange
   2. RS-485 – standard defining the electrical characteristics of drivers and receivers for use in balanced digital multipoint systems

B. National Fire Protection Association (NFPA):
   1. NFPA 12 – Standard on Carbon Dioxide Extinguishing Systems.
   2. NFPA 13 – Installation of Sprinkler Systems.
   3. NFPA 15 – Standard for Water Spray Fixed Systems for Fire Protection.
   4. NFPA 16 – Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems.
   5. NFPA 16A – Standard for the Installation of Closed Head Foam-Water Sprinkler Systems.
   6. NFPA 17 – Dry Chemical Extinguishing Systems
   7. NFPA 17A – Wet Chemical Extinguishing Systems
   8. NFPA 70 – National Electrical Code (NEC).
   9. NFPA 72 – National Fire Alarm Code.
   10. NFPA 2001 – Clean Agent Extinguishing Systems
   11. NFPA 90A – Standard for the Installation of Air Conditioning and Ventilating Systems.
   12. NFPA 101 – Life Safety Code.
   13. NFPA 750 – Standard on Water Mist Fire Protection Systems.
   14. NFPA 5000 – Building Construction and Safety Code.

C. Underwriters Laboratories (UL):
   1. UL 268 – Standard for Smoke Detectors for Fire Alarm Signaling Systems.
   2. UL 864 9th Edition – Standard for Control Units and Accessories for Fire Alarm Systems.
      a. UOJZ, Control Units, System.
      b. SYZV Control Units, Releasing Device.
      c. UOXX, Control Unit Accessories, System.
   3. UL 1971 – Standard for Signaling Devices for the Hearing Impaired.

1.4 SYSTEM DESCRIPTION

A. A new intelligent reporting, microprocessor-controlled fire detection and notification system shall be installed in accordance with the specifications and as indicated on the Drawings.

B. Each Signaling Line Circuit (SLC) and Notification Appliance Circuit (NAC): Limited to only 80 percent of its total capacity during initial installation.

C. Control Panel shall be expandable from 2 to 128 SLC loops as necessary to accommodate future expansion

D. Basic Performance:
   1. Signaling Line Circuits (SLC) Serving Addressable Devices: Wired Class A.

2. Initiation Device Circuits (IDC) Serving Non-addressable Devices Connected to Addressable Monitor Modules: Wired Class A.
3. Notification Appliance Circuits (NAC) Serving Strobes and Horns: Wired Class A.
4. On Class A Configurations: Single ground fault or open circuit on Signaling Line Circuit shall not cause system malfunction, loss of operating power, or ability to report alarm.
5. Alarm Signals Arriving at Control Panel: Not lost following primary power failure until alarm signal is processed and recorded.
7. Network Node Communications:
   a. System shall have the capability of networking with other Control Panels on single pair of copper wires or fiber optic cables.
8. Signaling Line Circuits (SLC):
   a. Reside in remote panels with associated audio zones.
   b. SLC modules shall operate in peer-to-peer fashion with all SLC modules in the Control Panel.
   c. On loss of an SLC module, each remaining panel shall continue to communicate with remainder of system, including all SLC and control functions
9. NAC Circuits: Arranged such that there is a minimum of 1 audible device per fire alarm zone.
10. Notification Appliance Circuits (NAC), and Control Equipment: Arranged such that loss of any 1 NAC circuit will not cause loss of any other NAC circuit in system.
11. NAC Circuits:
   a. Electrically supervised for open and short circuit conditions.
   b. If short circuit exists on NAC circuit, it shall not be possible to activate that circuit.

E. Basic System Functional Operation: When fire alarm condition is detected and reported by 1 of the system alarm initiating devices, the following functions shall immediately occur:
1. System Alarm LEDs: Flash.
2. Local Piezo-Electric Signal in Control Panel: Sound at a pulse rate.
3. 80-Character LCD Display: Indicate all information associated with fire alarm condition, including type of alarm point and its location within protected premises.
4. Historical Log: Record information associated with fire alarm control panel condition, along with time and date of occurrence.
5. System output programs assigned via control-by-event equations to be activated by particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.
6. Strobes flash synchronized continuously.
7. Audible devices sound continuous Temporal pattern until system is reset.

F. Fire Alarm System Functionality:
1. Provide complete, electrically supervised distributed, Class A networked analog/addressable fire alarm and control system, with analog initiating devices.
2. Fire Alarm System:
   a. Incorporate E3 Series multiprocessor-based control panel one or more Intelligent Loop Interface (ILI-MB-E3 or ILI95-MB-E3), and 80 character LCD annunciator.
   b. Intelligent Network Transponders (INX), communicating over peer-to-peer token ring network with standard capacity of 64 nodes expandable to 122.
3. Each ILI-MB-E3 or ILI95-MB-E3 SLC module: Incorporate 2 Signaling Line Circuits (SLC), with capacity to support up to 159 analog addressable detectors and 159 addressable modules per SLC or support in Apollo mode up to 126 detectors and modules per ILI95-MB-E3 SLC.

4. Control Panel shall incorporate Boolean control-by-event programming, including as a minimum AND, OR, NOT, and Timer functions.
5. Control Panel shall have the capability to accept firmware upgrades via connection with laptop computer, without requirement of replacing microchips.
6. Control Panel shall have the capability of having an integral DACT (digital alarm communicator transmitter) that can report to single central station monitoring account.
7. Control Panel shall have the capability of storing its entire program, and allow installer to activate only devices that are installed during construction, without further downloading of system.
8. Password Protection: Each system shall be provided with 4 levels of password protection with up to 16 passwords.
9. Network:
   a. Based on peer-to-peer token ring technology operating at 625 K baud, using Class A configuration.
   b. Capability of using twisted-pair wiring, pair of fiber optic Multi-mode cable strands up to 200 microns or Single-mode optimized for 9/125 microns, or any combination, to maximize flexibility in system configuration.
10. Each Network Node:
    a. Capability of being programmed off-line using Windows-based software supplied by fire alarm system manufacturer. Capability of being downloaded by connecting THE laptop computer into any other node in system. Systems that require system software to be downloaded to each transponder at each transponder location shall not be acceptable.
    b. Capability of being grouped with any number of additional nodes to produce a “Region”, allowing that group of nodes to act as 1, while retaining peer-to-peer functionality. Systems utilizing “Master/Slave” configurations shall not be acceptable.
    c. Capability of annunciating all events within its “Region” or annunciating all events from entire network, on front panel LCD without additional equipment.
11. Each SLC Network Node: Capability of having integral DACT (digital alarm communicator transmitter) that can report events in either its region, or entire network to single central station monitoring account.
12. Each Control Panel: Capability of storing its entire program, and allow installer to activate only devices that are installed during construction, without further downloading of system.
13. Password Protection: Each system shall be provided with 4 levels of password protection with up to 16 passwords.

1.5 SUBMITTALS

Specifier Notes: Edit the Submittals article as required for the project.

A. Comply with Section 01330 (01 33 00) – Submittal Procedures.

B. Include sufficient information, clearly presented, to determine compliance with the specifications and the Drawings.

C. Equipment Submittals:
   1. Cover Page: Indicate the following:
      a. Project name and address.
      b. Engineered systems distributor’s name and other contact information.

c. Installing contractor's name and other contact information.
d. Date of equipment submittals. Indicate on revised submittals the original submittal date and revised submittal date.

2. Table of Contents: Lists each section of equipment submittal.
3. Scope of Work Narrative: Detail indented scope of work.
4. Sequence of Operations: Use matrix or written text format, detailing activation of each type of device and associated resulting activation of the following:
   a. Control panel.
   b. Annunciator panels.
   c. Notification appliances.
   d. Building fire safety functions, including elevator recall, elevator power shutdown, door lock release, door holder release, HVAC unit shutdown, smoke evacuation system activation, and stair pressurization fan activation.
5. Bill of Material: Indicate for each component of system the following:
   a. Quantity.
   b. Model number.
   c. Description.
6. SLC Circuit Schedule: Detail address and associated description of each addressable device. Clearly provide information that indicates number of both active and spare addresses.
7. Battery Calculations: Show load of each of, and total of, components of system along with standby and alarm times that calculations are based on. Show calculated spare capacity and size of intended battery.

D. Shop Drawings:
1. Cover Page: Indicate the following:
   a. Project name and address.
   b. Engineered systems distributor's name and other contact information.
   c. Installing contractor's name and other contact information.
   d. Date of equipment submittals. Indicate on revised submittals the original submittal date and revised submittal date.
2. Floor Plans:
   a. Provide separate floor plan for each floor.
   b. If a floor plan must be split using match lines to fit on the page, provide match lines and match line references that refer to sheet number that shows area on opposite side of match line.
   c. Prepare using AutoCAD.
   d. Prepare to scale 1/8 inch = 1'-0", unless otherwise required by the Architect or Engineer.
   e. Show equipment and device locations.
   f. Show wiring information in point-to-point format.
   g. Show conduit routing, if required by the AHJ.
3. Title Block: Provide on each sheet and include, at a minimum, the following:
   a. Project name.
   b. Project address.
   c. Sheet name.
   d. Sheet number.
   e. Scale of drawing.
   f. Date of drawing.
   g. Revision dates, if applicable.

4. Control Panel: Provide sheet that details exterior and interior views of control panel and clearly shows associated wiring information.
5. Annunciator Panels: Provide sheet that details exterior and interior views of annunciator panels and clearly shows associated wiring information.

E. Certification: Submit with equipment submittals and shop drawings, letter of certification from major equipment manufacturer, indicating proposed engineered system distributor is an authorized representative of major equipment manufacturer.

F. Project Record Drawings:
1. Submit complete project record drawings within 14 calendar days after acceptance test.
2. Project record drawings shall be similar to shop drawings, but revised to reflect changes made during construction.

G. Operation and Maintenance Manuals:
1. Submit complete operation and maintenance manuals within 14 calendar days after acceptance test.
2. Operation and maintenance manuals shall be similar to equipment submittals, but revised to reflect changes made during construction.
3. Include factory's standard installation and operating instructions.

1.6 QUALITY ASSURANCE

A. Codes and Standards:
1. NFPA: System shall comply with the following NFPA codes and standards:

Specifier Notes: Edit the following list of NFPA codes and standards as required for the project.

a. NFPA 12.
b. NFPA 13.
c. NFPA 15.
d. NFPA 16.
e. NFPA 16A.
f. NFPA 17
g. NFPA 17A
h. NFPA 70.
i. NFPA 72.
j. NFPA 2001
k. NFPA 90A.
l. NFPA 90B When smoke control is required by code.
m. NFPA 101.
n. NFPA 750.
o. NFPA 5000.

2. ADA: System shall conform to American with Disabilities Act (ADA).

B. To ensure reliability and complete compatibility, all items of fire alarm system, including control panels, power supplies, initiating devices, and notification appliances, shall be listed by Underwriters Laboratories Inc. (UL) and shall bear "UL" label.

C. Fire Alarm Control Panel Equipment: UL-listed under UL 864 Ninth Edition.

D. Equipment, Programming, and Installation Supervision:
   1. Provide services of approved Engineered systems distributor of Honeywell | Gamewell-FCI for equipment, programming, and installation supervision.
   2. Provide proof of factory training within 14 calendar days of award of the Contract.

E. Software Modifications:
   1. Provide services of Honeywell | Gamewell-FCI factory-trained and authorized technician to perform system software modifications, upgrades, or changes.
   2. Provide use of all hardware, software, programming tools, and documentation necessary to modify fire alarm system software on-site.
   3. Modification includes addition and deletion of devices, circuits, zones, and changes to system operation and custom label changes for devices or zones.
   4. System structure and software shall place no limit on type or extent of software modifications on-site.
   5. Modification of software shall not require power-down of system or loss of system fire protection while modifications are being made.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage: Store materials in clean, dry area indoors in accordance with manufacturer's instructions.

C. Handling: Protect materials from damage during handling and installation.

1.8 COORDINATION

Specifier Notes: Edit the following sentence as required.

A. Coordinate the Work of this section with the Work of other sections, including sprinkler systems as specified in Section _____, elevators as specified in Section _____, HVAC systems as specified in Section _____, and security/door locking systems as specified in Section _____ .

1.9 WARRANTY

A. Warranty Period for System Equipment: 1 year from date of final acceptance.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Honeywell | Gamewell-FCI, Honeywell Fire, 12 Clintonville Road, Northford, Connecticut 06472. Phone (203) 484-7161. Fax (203) 484-7118. Website: www.gamewell-fci.com.

B. References to manufacturer's model numbers and other information is intended to establish minimum standards of performance, function, and quality. Equivalent equipment from Gamewell may be substituted for the specified equipment, as long as minimum standards are met. No other manufacturers, other than Honeywell | Gamewell-FCI, Gamewell-FCI, FCI, and Gamewell will be considered for use on this project.

C. Substitute equipment proposed as equal to equipment specified shall meet or exceed requirements of this section. For equipment other than Honeywell | Gamewell-FCI E3 Series Expandable Emergency Evacuation Fire Alarm System, provide proof that such substitute equipment equals or exceeds features, functions, performance, and quality of specified equipment. This proof shall be provided by submission of a copy of specification with each copy of the submittals that has had each paragraph marked as either compliant or non-compliant along with a letter from engineering manager or product manager at factory that certifies information presented as either compliant or non-compliant including a detailed explanation of each paragraph identified as non-compliant. In order to ensure that the Owner is provided with a system that incorporates required survivability features, this letter shall also specifically certify that the system is capable of complying with the test requirements of this section.

2.2 FIRE ALARM SYSTEM

A. Fire Alarm System: Honeywell | Gamewell-FCI E3 Series Expandable Emergency Evacuation Fire Alarm System.

2.3 CONTROL PANEL HARDWARE

A. Intelligent Control Panel: Supply user interface, including LCD or touch-screen 1/4 VGA display Intelligent Loop Interface Modules (ILI-MB-E3), manual switching, Control Panel shall consist of the following units and components:
   1. System Cabinet (B-, C-, or D-Size Cabinet) with associated inner door.
   2. Power Supply Module (PM-9) with batteries.
   3. 80-Character LCD Display (LCD-E3).
   4. Intelligent Loop Main Board Interface (ILI-MB-E3).
   5. Optional Intelligent Loop Supplemental Interface (ILI-S-E3).
   6. Intelligent Loop Main Board Interface (ILI95-MB-E3).
   7. Optional Intelligent Loop Supplemental Interface (ILI95-S-E3).
   8. Optional DACT (DACT-E3).
   9. Optional 1/4 VGA touch-screen display (NGA).
   10. Optional LED Driver Module (ANU-48)
   11. Optional Auxiliary Switch Module (ASM-16).
   12. Optional ARCNET Repeater (RPT-E3) with fiber optic modules (FSL-E3 or FML-E3).
   13. Optional Addressable Node Expander (ANX-SR, ANX-MR-FO, ANX-MR-UTP).
   14. Optional 4.3 inch color touch-screen display (LCD-SLP)

B. System Cabinet:
   1. Surface or semi-flush mounted with texture finish.
   2. Consist of back box, inner door, and door.
   3. Available in at least 3 sizes to best fit project configuration.

4. Houses 1 or more PM-9 Power Supply Modules, 1 or more ILI-MB-E3 or ILI95-MB-E3, ILI-S-E3 or ILI95-S-E3 assemblies, and other optional modules as specified.
5. Construction: Dead-front steel construction with inner door to conceal internal circuitry and wiring.
6. Wiring: Terminated on removable terminal blocks to allow field servicing of modules without disrupting system wiring.

C. Power Supply Module (PM-9): Use latest technologies to provide power to the Control Panel and incorporate the following features:
1. Power-saving switching technology using no step-down transformers.
2. 9-amp continuous-rated output to supply up to all power necessary under normal and emergency conditions.
3. Integral battery charger with capacity to charge up to 55 amp-hour batteries while under full load.

D. Batteries:

Specifier Notes: Include **one** of the following **two** sentences.

1. Sufficient capacity to provide power for entire system upon loss of normal AC power for a period of 24 hours with 15 minutes of alarm signaling at end of this 24-hour period, as required by NFPA 72, Local Systems.
2. Sufficient capacity to provide power for entire system upon loss of normal AC power for a period of 60 hours with 15 minutes of alarm signaling at end of this 60-hour period, as required by NFPA 72, Auxiliary Systems.

E. LCD Display Module (LCD-E3):
1. LCD Display: 80-character RS-485 based textual annunciator with capability of being mounted locally or remotely. Provides audible and visual annunciation of all alarms and trouble signals. Provide dedicated LEDs for:
   a. AC Power On: Green.
   b. Alarm: Red.
   c. Supervisory: Yellow.
   d. System Trouble: Yellow.
   e. Power Fault: Yellow.
   f. Ground Fault: Yellow.
   g. System Silenced: Yellow.
2. 80-Character Alphanumeric Display: Provide status of all analog/addressable sensors, monitor and control modules. Display shall be liquid crystal type (LCD), clearly visible in dark and under all light conditions.
3. Panel shall contain 4 functional keys:
   a. Alarm Acknowledge.
   b. Trouble Acknowledge.
   c. Signal Silence.
   d. System Reset/Lamp Test.

4. Panel shall contain 3 configuration buttons:
   a. Menu/Back.
   b. Back Space/Edit.
   c. OK/Enter.

5. Panel shall have 12-key telephone-style keypad to permit selection of functions.

F. Intelligent Loop Interface (ILI-MB-E3/ILI95-MB-E3): System shall be of multiprocessor design to allow maximum flexibility of capabilities and operation. Intelligent Loop Interface shall be capable of mounting in stand-alone enclosure as specified.
   1. Field Programmable: System shall be capable of being programmed by Field Configuration Program (FCP), allowing programming to be downloaded via portable computer from any node on network.
   2. RS-232C Serial Output: Supervised RS-232C serial port shall be provided to operate remote printers and/or video terminals, accept downloaded program from portable computer, or provide 80-column readout of all alarms, troubles, location descriptions, time, and date. Communication shall be standard ASCII code operating from 1,200 to 115,200 baud rate.
   3. RS-485 Serial Output: Each ILI-MB-E3/ILI95-MB-E3 shall incorporate RS-485 bus via ribbon harness for connection of modules inside same cabinet, and via 4-wire quick connector for connection of modules up to 3,000 feet from cabinet. Each ILI-MB-E3's RS-485 bus shall support up to 16 ASM-16 auxiliary switch modules, 6 LCD-E3 main annunciators, and 5 LCD-7100 annunciators.
   4. Peer-to-Peer Panel Configuration: All Loop Interface Modules shall incorporate own programming, log functions, Central Processor Unit, and control-by-event (CBE) programming. If any loop driver becomes disabled, each remaining loop driver shall continue to communicate with remainder of network and maintain normal operation.
   5. Control-by-Event (CBE) Program: ILI-MB-E3 shall be capable of programming using Boolean logic including AND, OR, NOT, TIMING and COUNT, SCHEDULE functions to provide complete programming flexibility.
   6. Alarm Verification: Smoke detector alarm verification shall be standard option while allowing other devices such as manual stations and sprinkler flow to create immediate alarm. This feature shall be selectable for smoke sensors that are installed in environments prone to nuisance or unwanted alarms.
   7. Alarm Signals: All alarm signals shall be automatically latched or "locked in" at control panel until operated device is returned to normal and control panel is manually reset. When used for sprinkler flow, "SIGNAL SILENCE" switch may be bypassed, if required by AHJ.
   8. Electrically Supervised:
      a. Each SLC and NAC circuit shall be electrically supervised for opens, shorts, and ground faults. Occurrence of fault shall activate system trouble circuitry, but shall not interfere with proper operation of other circuits.
      b. Yellow "SYSTEM TROUBLE" LEDs shall light and system audible sounder shall steadily sound when trouble is detected in system. Failure of power, open or short circuits on SLC or NAC circuits, disarrangement in system wiring, failure of microprocessor or any identification module, or system ground faults shall activate this trouble circuit. Trouble signal shall be acknowledged by operating "TROUBLE ACKNOWLEDGE" switch. This shall silence sounder. If subsequent trouble conditions occur, trouble circuitry shall resound. During alarm, all trouble signals shall be suppressed with exception of lighting yellow "SYSTEM TROUBLE" LEDs.

9. Drift Compensation – Analog Smoke Sensors: System software shall automatically adjust each analog smoke sensor approximately once each week for changes in sensitivity due to effects of component aging or environment, including dust. Each sensor shall maintain its actual sensitivity under adverse conditions to respond to alarm conditions while ignoring factors which generally contribute to nuisance alarms. System trouble circuitry shall activate, display units that requires maintenance.
10. Analog Smoke Sensor Test: System software shall automatically test each analog smoke sensor a minimum of 3 times daily. Test shall be recognized functional test of each photocell (analog photoelectric sensors) and ionization chamber (analog ionization sensors) as required annually by NFPA 72. Failure of sensor shall activate system trouble circuitry, display "Test Failed" indication, and identify individual device that failed.
11. Off-Premises Connection:

Specifier Notes: Include **one** of the following **three** paragraphs.

a. Fire Alarm System: Connect via leased telephone lines to central station or remote station.
b. Fire Alarm System: Connect to local energy city master box.
c. Fire Alarm System: Connect via Digital Alarm Communicator Transmitter (DACT) and telephone lines to central station or remote station. Panel shall contain disconnect switch to allow testing of system without notifying fire department.

Specifier Notes: Include **one** of the following **three** paragraphs.

12. Remote Station Option: Fire department shall be consulted regarding authorized remote station serving municipality. Fire alarm system shall transmit alarm, supervisory, and trouble signals with alarm having priority over supervisory and trouble signals. Required phone lines shall be provided and installed between incoming telephone service and fire alarm system by Owner's telephone contractor under separate contract. Owner will be responsible for phone company costs.
13. Local Energy City Master Box Option: Fire alarm system shall be connected to local energy city master box. City master box shall be coded and timed in accordance with requirements of fire department. Box shall be surface or flush mounted and located as specified by building engineer and fire department.
14. Central Station Option: Fire alarm control panel shall provide Digital Alarm Communicator Transmitter (DACT) for signaling to central station. DACT shall contain "Dialer-Runaway" feature preventing unnecessary transmissions as result of intermittent faults in system and shall be Carrier Access Code (CAC) compliant, accepting up to 20-digit central station telephone numbers. Fire department shall be consulted as to the authorized central station companies serving municipality. Fire alarm system shall transmit both alarm and trouble signals, with alarm having priority over trouble signal. Contractor shall be responsible for all installation charges and Owner will be responsible for line lease charges.
15. Network Annunciator Option: Each ILI-MB-E3 or ILI95-MB-E3 and associated display shall provide option of being configured as network annunciator. Options for annunciation shall default as regional annunciator with capability of selecting global annunciation to provide system-wide protection and Acknowledge, Silence, and Reset capabilities.
16. Redundant History Log: Each ILI-MB-E3 or ILI95-MB-E3 shall contain full 4100 event history log supporting local and network functions. If a main processor or network node is

lost the entire log shall be accessible at any other Loop Interface board. This shall be demonstrated by removing power followed by extraction of history log from any loop driver location

17. LEDs Indicator and Outputs: Each ILI-MB-E3 or ILI95-ME3 Loop Interface shall incorporate as a minimum the following diagnostic LED indicators:
    a. Power: Green.
    b. Alarm: Red.
    c. Supervisory: Yellow.
    d. General Trouble: Yellow.
    e. Ground Fault: Yellow.
    f. Transmit: Green.
    g. Receive: Green.
18. Auxiliary Power Outputs: Each ILI-MB-E3/ILI95-MB-E3 Loop Interface shall provide the following supply outputs:
    a. 24 VDC non-resettable, 1 amp. maximum, power limited.
    b. 24 VDC resettable, 1 amp. maximum, power limited.
19. Microprocessor: Loop interface shall incorporate 32-bit RISC processor. Isolated "watchdog" circuit shall monitor microprocessor and upon failure shall activate system trouble circuits on display. Microprocessor shall access system program for all control-by-event (CBE) functions. System program shall not be lost upon failure of both primary and secondary power. Programming shall support Boolean logic including AND, OR, NOT, TIME DELAY functions for maximum flexibility.
20. Auto Programming: System shall provide for all SLC devices on any SLC loop to be pre-programmed into system. Upon activation of auto programming, only devices that are present shall activate. This allows for system to be commissioned in phases without need of additional downloads.
21. Environmental Drift Compensation: System shall provide for setting Environmental Drift Compensation by device. When detector accumulates dust in chamber and reaches unacceptable level but yet still below allowed limit, control panel shall indicate maintenance alert warning. When detector accumulates dust in chamber above allowed limit, control panel shall indicate maintenance urgent warning.
22. NON-FIRE Alarm Module Reporting: Non-reporting type ID shall be available for use for energy management or other non-fire situations. NON-FIRE point operation shall not affect control panel operation nor shall it display message at panel LDC. Activation of NON-FIRE point shall activate control by event logic, but shall not cause indication on control panel.
23. 1-Man Walk Test:
    a. System shall provide both basic and advanced walk test for testing entire fire alarm system. Basic walk test shall allow single operator to run audible tests on panel. All logic equation automation shall be suspended during test and while annunciators can be enabled for test, all shall default to disabled state. During advanced walk test, field-supplied output point programming shall react to input stimuli, such as CBE and logic equations. When points are activated in advanced test mode, each initiating event shall latch input. Advanced test shall be audible and shall be used for pull station verification, magnet activated tests on input devices, input and output device, and wiring operation/verification.
    b. Shall Automatically generate professionally formatted NFPA 72, NFPA 10, or Joint Commission Reports such as (GW-eVance Inspection Manager) A second technician will not be required at the fire panel during testing.

c. Test feature is intended to provide for certain random spot testing of system and is not intended to comply with requirements of testing fire alarm systems in accordance with NFPA 72, as it is impossible to test all functions and verify items such as annunciation with only 1 person.

24. Signaling Line Circuits: Each ILI-MB-E3 module shall provide communication with analog/addressable (initiation/control) devices via 2 signaling line circuits. Each signaling line circuit shall be capable of being wired Class B, Style 4 or Class A, Style 6. Circuits shall be capable of operating in NFPA Style 7 configuration when equipped with isolator modules between each module type device and isolator sensor bases. Each circuit shall communicate with a maximum of 159 analog sensors and 159 addressable monitor/control devices. Unique 40-character identifier shall be available for each device. Devices shall be of the Velocity series with capability to poll 10 devices at a time with a maximum polling time of 2 seconds when both SLCs are fully loaded.
25. Notification Appliance Circuits: 2 independent NAC circuits shall be provided on ILI-MB, polarized and rated at 2 amperes DC per circuit, individually over current protected and supervised for opens, grounds, and short circuits. They shall be capable of being wired Class B, Style Y or Class A, Style Z. On-board synchronization of System Sensor, Wheelock and Gentex notification appliances.
26. Alarm Dry Contacts: Provide alarm dry contacts (Form C) rated 2 amps at 30 VDC (resistive) and transfer whenever system alarm occurs.
27. Supervisory Dry Contacts: Provide supervisory dry contacts (Form C) rated 2 amps at 30 VDC (resistive) and transfer whenever system supervisory condition occurs.
28. Trouble Dry Contacts: Provide trouble dry contacts (Form C) rated 2 amps at 30 VDC (resistive) and transfer whenever system trouble occurs.
29. Permitted zone types shall be general zone, releasing zone, and special zone. Each output point (control module, panel circuit module) can support a list of up to eight zones including general zone, logic zone, releasing zone, and trouble zone. It shall be possible for output points to be assigned to list general alarm. Non-Alarm or Supervisory points shall not activate the general alarm zone.
30. Multiple Agent Releasing Zones: The system shall support up to eight releasing zones to protect against eight independent hazards. Releasing zones shall provide up to three cross-zone and four abort options to satisfy any local jurisdiction requirements.

G. Auxiliary Switch Module (ASM-16):
1. Each ASM-16 has 16 programmable push-button switches.
2. Each push-button switch has 3 associated status LEDs (red, yellow, and green), configurable to indicate any combination of functions.
3. Flexible switch configurations to allow auxiliary functions.
4. An insertable label to identify function of each switch and LEDs combination.
5. Provide capability to communicate with up to 16 ASM-16 modules locally, or up to 3,000 feet from the Control Panel.

H. Graphic Annunciator (NGA): Optional 1/4 VGA, touch-screen annunciator with the following characteristics:
1. Custom Graphics: Panel shall permit uploading of custom bit-mapped graphic to display screen. Graphic shall display when all systems are normal.
2. Intuitive Functions: In alarm or trouble condition, annunciator shall display only information pertaining to event, including control switches.
a. Trouble Condition: Display shall indicate cause of trouble. Only controls available to operator shall be Acknowledge and Reset functions.

b. Alarm Condition: Display shall indicate cause of alarm. Only controls available to operator shall be Acknowledge, Silence, and Reset functions.

I. Addressable Node Expander (ANX):
1. Addressable Node Expander shall provide interconnection between the Fire Alarm Control Panel networks.
2. ANX-MR-FO (Addressable Node Expander Multi-Ring with Fiber Optic connectors) and ANX-MR-UTP (Addressable Node Expander Multi-Ring with Fiber Optic and Twisted Pair connectors) shall expand the E3 Series network from 64 nodes to 122 nodes. ANX-SR (Addressable Node Expander Single Ring) will function in single 64 node systems.
3. ANX shall provide a Ethernet Port for use in Systems Integration and for use with Emergency Communication System (ECS) functions. The Ethernet port may also be used to communicate with a graphic interface software.

J. Network Repeater Module (RPT-E3):
1. Intelligent Network Interface shall provide interconnection and protection of remote INCC Command Centers and Transponders. Repeater shall regenerate and condition token passing, 625 K baud signal between units. Repeater shall be available in wire, or wire/fiber configurations as determined by field conditions.
2. Interface shall have jumper to allow selection of ground detection of wiring when used in wire mode. Interface shall have integral LEDs to display current status of board.
3. Fiber configurations shall use:
   a. Multi-Mode ST-type connectors with a maximum attenuation of 8db with 62.5/125 micron cable.
   b. Single-Mode LC-style connector with a maximum attenuation of 30db with 9/125 micron cable.

2.4 PRINTERS

A. Printers: Automatic type, printing code, time, date, location, category, and condition.
1. Provide hard-copy printout of all changes in status of system and time-stamp such printouts with current time-of-day and date.
2. Standard carriage with 80 characters per line.
3. Use standard pin-feed paper.
4. Enclose in separate enclosure suitable for placement on desktop or table.
5. Communicate with control using interface complying with EIA-232-D.
6. Power: 120 VAC at 60 Hz.

2.5 SUPPLEMENTAL NOTIFICATION APPLIANCE CIRCUIT (HPF24)

Specifier Notes: Specify Model HPF24S6, HPF24S8 or HPFF8, HPFF12 0r GFPS-6,GFPS-9

A. Supplemental Notification Appliance Circuit (HPF24) shall be Model [HPF24S6] [HPF24S8] offering [up to 6.0 amps (4.0 amps continuous)] [8.0 amps (6.0 amps continuous)] of regulated 24-volt power. HPF24 shall include the following features:
1. Integral Charger: Charge up to 18.0 amp-hour batteries and support 60-hour standby.
2. 2 Input Triggers. Input trigger shall be Notification Appliance Circuit (from fire alarm control panel) or relay.
3. Surface-mount back box.
4. Ability to delay AC fail delay in accordance with applicable NFPA requirements.

5. Power limited circuitry in accordance with applicable UL standards.
6. Operates as sync follower or a sync generator.

B. Supplemental Notification Appliance Circuit (HPFF) shall be Model [HPFF8] [HPFF12] offering [up to 8.0 amps (8.0 amps continuous)] [12.0 amps (12 amps continuous)] of regulated 24-volt power. HPFF shall include the following features:
1. Integral Charger: Charge up to 18.0 amp-hour batteries and support 60-hour standby.
2. 2 Input Triggers. Input trigger shall be Notification Appliance Circuit (from fire alarm control panel) or relay.
3. Surface-mount back box.
4. Ability to delay AC fail delay in accordance with applicable NFPA requirements.
5. Power limited circuitry in accordance with applicable UL standards.
6. Operates as sync follower or a sync generator.

C. Supplemental Notification Appliance Circuit (GFPS) shall be Model [GFPS-6] [GFPS-9] offering [up to 6.0 amps (6.0 amps continuous)] [9.0 amps (12.0 amps continuous)] of regulated 24-volt power. GFPS shall include the following features:
1. Integral Charger: Charge up to 35.0 amp-hour batteries and support 60-hour standby.
2. 2 Input Triggers. Input trigger shall be Notification Appliance Circuit (from fire alarm control panel) or relay.
3. Surface-mount back box.
4. Ability to delay AC fail delay in accordance with applicable NFPA requirements.
5. Power limited circuitry in accordance with applicable UL standards.
6. Operates as sync follower or a sync generator

2.6 SYSTEM PERIPHERALS - SYSTEM SENSOR VELOCITI

A. Addressable Devices – General:
1. Provide address-setting means using rotary-decimal switches.
2. Use simple to install and maintain decade-type (numbered 0 to 15) address switches by using standard screwdriver to rotate 2 dials on device to set address. Devices which use binary address set via dipswitch packages, handheld device programmer, or other special tools for setting device address shall not be acceptable.
3. Detectors: Analog and addressable. Connect to fire alarm control panel's Signaling Line Circuits.
4. Addressable Thermal and Smoke Detectors: Provide 2 status LEDs. Both LEDs shall flash under normal conditions, indicating detector is operational and in regular communication with control panel, and both LEDs shall be placed into steady illumination by control panel, indicating alarm condition has been detected. If required, flashing mode operation of detector LEDs can be programmed off via fire control panel program.
5. Fire Alarm Control Panel: Permit detector sensitivity adjustment through field programming of system. Sensitivity can be automatically adjusted by panel on time-of-day basis.
6. Using software in ILI-MB-E3, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. Detectors shall be listed by UL as meeting calibrated sensitivity test requirements of NFPA 72, Chapter7.
8. Following bases and auxiliary functions shall be available:
   a. Standard base with remote LED output.
   b. Sounder base rated at 85 dBA minimum.
   c. Intelligent Addressable Sounder base rated at 75 dBA minimum.
   d. Form-C relay base rated 30 VDC, 2.0 A.

e. Isolator base.

9. Detectors shall provide test means whereby they will simulate alarm condition and report that condition to control panel. Such test shall be initiated at detector itself by activating magnetic switch or initiated remotely on command from control panel.
10. Detectors shall store internal identifying type code that control panel shall use to identify type of device (PHOTO, THERMAL).

B. Addressable Manual Stations (MS-7AF):
1. Manual Fire Alarm Stations: Non-code, non-break glass type, equipped with key lock so they may be tested without operating handle.
2. Operated Station: Visually apparent, as operated, at a minimum distance of 100 feet (30.5 m) from front or side.
3. Stations shall be designed so after actual activation, they cannot be restored to normal except by key reset.
4. Manual stations shall be constructed of Lexan with clearly visible operating instructions provided on cover. The word FIRE shall appear on front of stations in raised letters, 1.75 inches (44 mm) or larger.
5. Addressable manual stations shall, on command from control panel, send data to panel representing state of manual switch and addressable communication module status.

C. Intelligent Thermal Detectors (ATD-L3R/ATD-L3R-IV): Intelligent addressable devices rated at 135 degrees F (58 degrees C) and have rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. Connect via 2 wires to fire alarm control panel signaling line circuit.

D. Intelligent Photoelectric Smoke Detectors (ASD-PL3/ASD-PL3-IV): Intelligent photoelectric smoke detector shall be a Honeywell Gamewell-FCI model number ASD-PL3 or ASD-PL3-IV. Smoke detector shall be an addressable intelligent photoelectric smoke detector and shall connect with two wires to the fire alarm control panel signaling line circuit (SLC). The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.

E. Intelligent Multi-Criteria Acclimating Detectors (MCS-PTIR/MCS-PTIR-IV):
1. Addressable device designed to monitor a minimum of photoelectric and thermal technologies in single-sensing device. Include ability to adapt to its environment by utilizing built-in microprocessor to determine its environment and choose appropriate sensing settings. Allow wide sensitivity window, with no less than 1 to 4 percent per foot obscuration. Utilize advanced electronics that react to slow smoldering fires and thermal properties within single sensing device.
2. Microprocessor: Capable of selecting appropriate sensitivity levels based on environment type it is in, such as office, manufacturing, or kitchen, and then have ability to automatically change setting as environment changes, as when walls are moved or as occupancy changes.
3. Intelligent multi-criteria detection device shall include ability to combine signal of thermal sensor with signal of photoelectric signal to react hastily in event of fire situation. Include inherent ability to distinguish between fire condition and false alarm condition by examining characteristics of thermal and smoke sensing chambers and comparing them to database of actual fire and deceptive phenomena.

F. Intelligent High Sensitivity Detectors (ASD-LS3): High sensitivity photoelectric smoke detector designed for Very Early Warning Fire Detection. The high-sensitivity detector features a smoke-sensing chamber and patented optic block designed to amplify signals from smoke but diminish stray internal reflections that can cause false alarms. LED technology allows detector to achieve sensitivity levels from 0.02 percent-per-foot to 2 percent-per-foot obscuration. Software processing includes multi-alert drift compensation, internal self-diagnostics, and superior transient signal rejection algorithms to produce unprecedented stability at ultra-high sensitivities across the full temperature range.

G. Intelligent Fire/Carbon Monoxide Detectors (MCS-COF3/MCS-COF3-IV):
1. The detector shall be comprised of four sensing elements, including a photoelectric (light-scattering) particulate sensor, an electrochemical CO sensor, a daylight-filtered infrared (IR) sensor and solid state thermal sensor(s) rated at 135°F (57.2°C). The device shall be able to indicate distinct smoke and heat alarms.
2. The advanced multi-criteria detection device shall include the ability to combine the signal of the photoelectric signal with other sensing elements in order to react quickly in the event of a fire situation. It shall also include the inherent ability to distinguish between a fire condition and a nuisance alarm condition. The detector shall be capable of selecting the appropriate sensitivity levels based on the environment type (office, manufacturing, kitchen, etc.) in which it is installed, and then have the ability to automatically change the setting as the environment changes.
3. The CO detector component shall be capable of a functional gas test using a canned test agent to test the functionality of the CO sensing cell.
4. The detector shall indicate CO trouble conditions, including six months of sensor life remaining and sensor life has expired. The detector shall indicate a combined signal for any of the following: low chamber trouble, thermistor trouble, CO self test failure, IR self test failure, and freeze warning
5. The MCS-COF3 Fire/CO Detector shall be used with the B200S Intelligent Sounder Base.

H. Intelligent Sounder Base (B200S-WH/B200S-IV):
1. The B200S sounder base “listens in” to the SLC communication between the attached sensor head and the fire alarm control panel (FACP) to adopt the same address as the detector, but as a unique device type on the loop. The FACP can then be programmed to use that address to command an individual sounder or a group of sounders to activate. The command set from the panel can be programmed to the specific event, allowing selection of volume, tone, and group. In addition, the FACPs will enable custom tone patterns.
2. The sounder can be programmed to be silenced whenever a live page or active message is being played over the system.

I. Intelligent Low Frequency Sounder Base (B200S-LF-WH/B200S-LF-IV):
1. The B200S sounder base “listens in” to the SLC communication between the attached sensor head and the fire alarm control panel (FACP) to adopt the same address as the detector, but as a unique device type on the loop. The FACP can then be programmed to use that address to command an individual sounder or a group of sounders to activate. The command set from the panel can be programmed to the specific event, allowing selection of volume, tone, and group. In addition, the FACPs will enable custom tone patterns.
2. The sounder can be programmed to be silenced whenever a live page or active message is being played over the system.

J. Intelligent Duct Smoke Detector Base (DNR, DNRW):
   1. In-Duct Smoke Detector Housing: Use ASD-PL3R/ASD-PL3R-IV intelligent photoelectric detector which provides continuous analog monitoring and alarm verification from panel.
   2. When sufficient smoke is sensed, alarm signal is initiated, and appropriate action taken to shut down or change over air handling systems to help prevent rapid distribution of toxic smoke and fire gases throughout areas served by duct system.
   3. Duct Smoke Detectors Mounted Above Ceiling or Otherwise Obstructed from Normal View: Provide an (RTS151KEY) Remote test station accessory, designed to test a remotely located Intelligent Duct Smoke detector with remote alarm indicator.
   4. Each Detector: Install in either supply side or return side duct in accordance with local mechanical code.
   5. DST Sampling Tube
      a. No tools needed for installation or removal
      b. Installs/removes from front or back of detector
      c. Available in 1 ft, 1.5ft, 3 ft, 5 ft, and 10 ft lengths

K. Addressable Dry Contact Monitor Modules (AMM-2F):
   1. Provide to connect 1 supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to 1 of the fire alarm control panel SLCs.
   2. Mount in standard deep electrical box.
   3. IDC Zone: Suitable for Style B operation.

L. Addressable Dry Contact Monitor Modules (AMM-4F):
   1. Provide to connect 1 supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to 1 of the fire alarm control panel SLCs.
   2. Mount in 4-inch (102-mm) square, 2-1/8-inch (54-mm) deep electrical box.
   3. IDC Zone: Suitable for Style D or Style B operation.
   4. LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

M. Addressable Dry Contact Monitor Modules (AMM-2IF):
   1. Provide to connect 2 supervised IDC zones of conventional alarm initiating devices (any N.O. dry contact device) to 1 of the fire alarm control panel SLCs.
   2. Mount in 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box.
   3. IDC Zones: Suitable for Style B operation.
   4. LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

N. Addressable Two Input and Two Output Modules (AMM-2RIF):
   1. Provide two isolated sets of Form-C contacts, which operate as a single pole double throw switch. The module shall allow the control panel to switch these contacts on command. The module shall not provide supervision for the notification appliance circuit (NAC). Module shall have both normally open and normally closed connections available for field wiring. Two input modules shall connect two supervised initiating device circuit (IDC) or zone of conventional alarm initiating devices (any normally open dry contact device) to the fire alarm control panel signaling line circuit (SLC) Loop.
   2. Mount in 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box.
   3. IDC Zones: Suitable for Style B operation.

4. LEDs: Four LEDs that are controlled by the panel to indicate status of each input and output. Coded signals, transmitted from the panel, can cause the LED to blink, latch on, or latch off. Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

O. Addressable Dry Contact Monitor Modules (MMI-10F):
1. Provide to connect 10 supervised Style B IDC zones or 5 supervised Style D IDC zones of conventional alarm initiating devices (any N.O. dry contact device) to 1 of the fire alarm control panel SLCs.
2. Mount in factory-supplied MBB-2 or MBB-6 enclosure.
3. LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

P. 2-Wire Detector Monitor Modules (AMM-4SF):
1. Provided to connect 1 supervised IDC zone of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device).
2. Mount in 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box or to optional surface-mounted back box.
3. IDC Zone: Wired for Class A or B (Style D or Style B) operation.
4. LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

Q. 2-Wire Detector Monitor Modules (MMI-6SF):
1. Provided to connect 6 supervised Class B IDC zones of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device).
2. Mount in factory-supplied MBB-2 or MBB-6 enclosure.
3. LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

R. Addressable Control Modules (AOM-2SF):
1. Provide to supervise and control operation of 1 conventional NAC of compatible, 24-VDC powered, polarized audio/visual notification appliances or UL-listed polarized relays for fan shutdown and other auxiliary control functions.
2. Mount in standard 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box or to surface-mounted back box.
3. Control Module NAC: Wire for Style Z or Style Y (Class A/B) with up to 1 amp of inductive signal or 2 amps of resistive signal operation. Relay coil shall be magnetically latched to reduce wiring connection requirements and to ensure 100 percent of all auxiliary relay or NACs shall be energized at same time on same pair of wires.
4. Audio/Visual Power: Provide by separate supervised power circuit from main fire alarm control panel or from supervised, UL-listed remote power supply.

S. Addressable Control Modules (MMO-6SF):
1. Provide to supervise and control operation of 1 conventional NAC of compatible, 24-VDC powered, polarized audio/visual notification appliances or UL-listed polarized relays for fan shutdown and other auxiliary control functions.
2. Mount in factory-supplied MBB-2 or MBB-6 enclosure.
3. LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

4. Control module NAC: Wire for Style Z or Style Y (Class A/B) with up to 1 amp of inductive signal or 2 amps of resistive signal operation. Relay coil shall be magnetically latched to reduce wiring connection requirements and to ensure 100 percent of all auxiliary relay or NACs shall be energized at same time on same pair of wires.
5. Audio/Visual Power: Provide by separate supervised power circuit from main fire alarm control panel or from supervised, UL-listed remote power supply.

T. Addressable Releasing Modules (TC810S1000)
1. Provide supervision and control operation releasing agent solenoids.
2. The module shall operate on a redundant protocol for added protection
3. The module shale be configurable for Style Z or Style Y (Class A or Class B) and support one 24 volt or two 12 volt solenoids.

U. Addressable Relay Modules (AOM-2RF):
1. Available for HVAC control and other building functions. Relay shall have 2 Form C sets of contacts that operate in tandem and are rated for a minimum of 2.0 amps resistive or 1.0 amps inductive. Relay coil shall be magnetically latched to reduce wiring connection requirements and to ensure 100 percent of all auxiliary relay or NACs shall be energized at same time on same pair of wires.
2. Mount in standard 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box or to surface-mounted back box.

V. Addressable Relay Modules (MMO-6RF):
1. Available for HVAC control and other building functions. Relay shall be Form C and rated for a minimum of 2.0 amps resistive or 1.0 amps inductive. Relay coil shall be magnetically latched to reduce wiring connection requirements and to ensure 100 percent of all auxiliary relay or NACs shall be energized at same time on same pair of wires.
2. Mount in factory-supplied MBB-2 or MBB-6 enclosure.
3. LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

W. Isolator Modules (M500X):
1. Provide to automatically isolate wire-to-wire short circuits on SLC Class A or Class B branch. Isolator module shall limit number of modules or detectors that may be rendered inoperative by short-circuit fault on SLC loop segment or branch. At least 1 isolator module shall be provided for each floor or protected zone of building. No more than 25 devices shall be connected to 1 isolator module.
2. If wire-to-wire short occurs, isolator module shall automatically open-circuit (disconnect) SLC. When short-circuit condition is corrected, isolator module shall automatically reconnect isolated section.
3. Does not require address-setting, and its operations shall be totally automatic. Not necessary to replace or reset isolator module after normal operation.
4. Mount in standard 4-inch (101.6-mm) deep electrical box or in surface-mounted back box.
5. Single LED: Flash to indicate isolator is operational and illuminate steadily to indicate short-circuit condition has been detected and isolated.

X. Conventional Heat Detectors:
1. Combination rate-of-rise and fixed temperature rated at 135 degrees F (57.2 degrees C) for areas where ambient temperatures does not exceed 100 degrees F (37.7 degrees C),

and 200 degrees F (93.3 degrees C) for areas where temperature does not exceed 150 degrees F (65.5 degrees C).
2. Low profile, ceiling-mount type with positive indication of activation.
3. Rate-of-Rise Element: Air chamber, flexible metal diaphragm, and factory-calibrated, moisture-proof, trouble-free vent, and operate when rate of temperature rise exceeds 15 degrees F (9.4 degrees C) per minute.
4. Fixed-Temperature Element: Fusible-alloy retainer and actuator shaft.
5. Smooth Ceiling Rating: 2,500 square feet (762 m^2).

Y. Conventional Photoelectric Area Smoke Detectors:
1. 24-VDC, 2-wire, ceiling-mounted, light-scattering type using LEDs light source.
2. Each Detector: Remote LEDs output and built-in test switch.
3. Provide on twist-lock base.
4. Perform calibrated sensitivity and performance test on detector without need for generation of smoke. Test method shall test all detector circuits.
5. Visual Indication of Alarm: Provide by dual-latching LEDs on detector, seen from ground level over 360 degrees. LEDs shall flash every 10 seconds, indicating power is applied to detector.
6. Detector shall not go into alarm or trouble when exposed to air velocities of up to 3,000 feet (914.4 m) per minute.
7. Detector Screen and Cover Assembly: Easily removable for field cleaning of detector chamber.
8. Field-Wire Connections: Made to base through use of clamping plate and screw.

Z. Conventional Ionization-Type Smoke Detectors:
1. 2-wire, 24-VDC type using dual uni-polar chamber.
2. Each Detector: Remote LEDs output and built-in test switch.
3. Provide on twist-lock base.
4. Perform calibration sensitivity and performance test on detector without need for generation of smoke.
5. Visual Indication of Alarm: Provide by dual-latching LEDs over 360 degrees, on detector, seen from ground level. LEDs shall flash every 10 seconds, indicating power is applied to detector.
6. Detector shall not alarm or trouble when exposed to air velocities of up to 1,200 feet (365.76 m) per minute.
7. Detector Screen and Cover Assembly: Easily removable for field cleaning of detector chamber.
8. Field-Wire Connections: Made to base through use of clamping plate and screw.

AA. Addressable Imaging Beam Detectors (OSI-RH-GW):
1. Single-ended reflecting design.
2. Six user-selectable sensitivity levels.
3. Operates in a range up to 492ft feet.
4. Temperature Range of Device: Minus 22 degrees F to 131 degrees F.
5. Beam Detector: Automatic gain control to compensate for gradual signal deterioration from dirt accumulation on lenses.
6. UL Listed.
7. Ability to be tested using calibrated test filters or magnet-activated remote test station.

2.7.1 SYSTEM PERIPHERALS – Apollo XP95

A. XP95 Addressable Devices – General:
   1. Provide address-setting means using card inserts which are built into the base or module.
   2. Use simple to install and maintain binary-type (numbered 1 to 64) address switches by using breaking the tabs to set address.
   3. Detectors: Analog and addressable. Connect to fire alarm control panel's Signaling Line Circuits.
   4. Addressable Thermal and Smoke Detectors: Provide 1 status LED. The LED shall flash under normal conditions, indicating detector is operational and in regular communication with control panel, and the LED shall be placed into steady illumination by control panel, indicating alarm condition has been detected. If required, flashing mode operation of detector LED can be programmed off via fire control panel program.
   5. Fire Alarm Control Panel: Permit detector sensitivity adjustment through field programming of system. Sensitivity can be automatically adjusted by panel on time-of-day basis.
   6. Using software, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. Detectors shall be listed by UL as meeting calibrated sensitivity test requirements of NFPA 72, Chapter 7.
   7. Detectors shall be ceiling-mounted and shall include separate twist-lock base with tamper-proof feature.
   8. Following bases and auxiliary functions shall be available:
      a. Standard base with remote LED output.
      b. Sounder base rated at 85 dBA minimum.
      c. Form-C relay base rated 30 VDC, 2.0 A.
      d. Isolator base.
   9. Detectors shall provide test means whereby they will simulate alarm condition and report that condition to control panel. Such test shall be initiated at detector itself by canned smoke or initiated remotely on command from control panel.
   10. Detectors shall store internal identifying type code that control panel shall use to identify type of device (ION, PHOTO, THERMAL).

B. Addressable Manual Stations (MS95-L):
   1. Manual Fire Alarm Stations: Non-code, non-break glass type, equipped with key lock so they may be tested without operating handle.
   2. Operated Station: Visually apparent, as operated, at a minimum distance of 100 feet (30.5 m) from front or side.
   3. Stations shall be designed so after actual activation, they cannot be restored to normal except by key reset.
   4. Manual stations shall be constructed of Lexan with clearly visible operating instructions provided on cover. The word FIRE shall appear on front of stations in raised letters, 1.75 inches (44 mm) or larger.
   5. Addressable manual stations shall, on command from control panel, send data to panel representing state of manual switch and addressable communication module status.

C. Intelligent Thermal Detectors (XP95-T): Intelligent addressable devices rated at 194 degrees F (90 degrees C) and have rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. Connect via 2 wires to fire alarm control panel signaling line circuit.

D. Intelligent Photoelectric Smoke Detectors (XP95-P): Use photoelectric (light-scattering) principal to measure smoke density and shall, on command from control panel, send data to panel representing analog level of smoke density.

E. Intelligent Ionization Smoke Detectors (XP95-I): Use dual-chamber ionization principal to measure products of combustion and shall, on command from control panel, send data to panel representing analog level of products of combustion.

F. Intelligent Multi-Criteria Detectors (XP95-M):
   1. Addressable device designed to monitor a minimum of photoelectric and thermal technologies in single-sensing device. Include ability to adapt to its environment by utilizing built-in microprocessor to determine its environment and choose appropriate sensing settings. Allow wide sensitivity window, with no less than 1 to 4 percent per foot obscuration. Utilize advanced electronics that react to slow smoldering fires and thermal properties within single sensing device.
   2. Microprocessor: Capable of selecting appropriate sensitivity levels based on environment type it is in, such as office, manufacturing, or kitchen, and then have ability to automatically change setting as environment changes, as when walls are moved or as occupancy changes.
   3. Intelligent multi-criteria detection device shall include ability to combine signal of thermal sensor with signal of photoelectric signal to react hastily in event of fire situation. Include inherent ability to distinguish between fire condition and false alarm condition by examining characteristics of thermal and smoke sensing chambers and comparing them to database of actual fire and deceptive phenomena.

G. Intelligent Duct Smoke Detectors (SL-DAA-P/SL-DAA-N):
   1. In-Duct Smoke Detector Housing: Use on-board intelligent photoelectric or ionization detector, which provides continuous analog monitoring and alarm verification from panel.
   2. When sufficient smoke is sensed, alarm signal is initiated, and appropriate action taken to shut down or change over air handling systems to help prevent rapid distribution of toxic smoke and fire gases throughout areas served by duct system.
   3. Duct Smoke Detectors Mounted Above Ceiling or Otherwise Obstructed from Normal View: Provide with remote alarm indicator.
   4. Each Detector: Install in either supply side or return side duct in accordance with local mechanical code.

H. Addressable Dry Contact Monitor Modules (PID-95/PID-95P):
   1. Provide to connect 1 supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to 1 of the fire alarm control panel SLCs.
   2. Mount in standard deep electrical box or plastic plate.
   3. IDC Zone: Suitable for Style B operation.

I. Addressable Dry Contact Monitor Modules (CZI-95):
   1. Provide to connect 1 supervised IDC zone of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device) to 1 of the fire alarm control panel SLCs.
   2. Mount in 4-inch (102-mm) square, 2-1/8-inch (54-mm) deep electrical box.
   3. IDC Zone: Suitable for Style B, C, D or Style E operation.
   4. LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

J. Addressable Control Modules (SCE-95):

1. Provide to supervise and control operation of 1 conventional NAC of compatible, 24-VDC powered, polarized audio/visual notification appliances or UL-listed polarized relays for fan shutdown and other auxiliary control functions.
2. Mount in standard 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box or to surface-mounted back box.
3. Control Module NAC: Wire for Style Z or Style Y (Class A/B) with 2 amps of resistive signal operation. Relay coil shall be magnetically latched to reduce wiring connection requirements and to ensure 100 percent of all auxiliary relay or NACs shall be energized at same time on same pair of wires.
4. Audio/Visual Power: Provide by separate supervised power circuit from main fire alarm control panel or from supervised, UL-listed remote power supply.

K. Addressable Relay Modules (RCE-95):
1. Available for HVAC control and other building functions. Relay shall have 1 Form C set of contacts and are rated for a minimum of 2.0 amps resistive. Relay coil shall be magnetically latched to reduce wiring connection requirements and to ensure 100 percent of all auxiliary relay or NACs shall be energized at same time on same pair of wires. The device shall provide positive feedback of the controlled equipment's status annunciating upon activation.
2. Mount in standard 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box or to surface-mounted back box.

L. Addressable Building Control Modules (BCE-95):
1. Available for building functions that require three position (On/Off/Auto) control capability. Relay shall have 1 Form C set of contacts and are rated for a minimum of 2.0 amps resistive. Relay coil shall be magnetically latched to reduce wiring connection requirements and to ensure 100 percent of all auxiliary relay or NACs shall be energized at same time on same pair of wires. The device shall provide positive feedback of the controlled equipment's status annunciating upon activation.
2. Mount in standard 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box or to surface-mounted back box.

M. Isolator Modules (XP95-LI):
1. Provide to automatically isolate wire-to-wire short circuits on SLC Class A or Class B branch. Isolator module shall limit number of modules or detectors that may be rendered inoperative by short-circuit fault on SLC loop segment or branch. At least 1 isolator module shall be provided for each floor or protected zone of building. No more than 20 devices shall be connected to 1 isolator module.
2. If wire-to-wire short occurs, isolator module shall automatically open-circuit (disconnect) SLC. When short-circuit condition is corrected, isolator module shall automatically reconnect isolated section.
3. Does not require address-setting, and its operations shall be totally automatic. Not necessary to replace or reset isolator module after normal operation.
4. Mount in unique base, eliminating addressable sensors from being installed incorrectly.
5. Single LED: Flash to indicate isolator is operational and illuminate steadily to indicate short-circuit condition has been detected and isolated.

N. Conventional Heat Detectors:
   1. Combination rate-of-rise and fixed temperature rated at 135 degrees F (57.2 degrees C) for areas where ambient temperatures does not exceed 100 degrees F (37.7 degrees C), and 200 degrees F (93.3 degrees C) for areas where temperature does not exceed 150 degrees F (65.5 degrees C).
   2. Low profile, ceiling-mount type with positive indication of activation.
   3. Rate-of-Rise Element: Air chamber, flexible metal diaphragm, and factory-calibrated, moisture-proof, trouble-free vent, and operate when rate of temperature rise exceeds 15 degrees F (9.4 degrees C) per minute.
   4. Fixed-Temperature Element: Fusible-alloy retainer and actuator shaft.
   5. Smooth Ceiling Rating: 2,500 square feet (762 m^2).

O. Conventional Photoelectric Area Smoke Detectors:
   1. 24-VDC, 2-wire, ceiling-mounted, light-scattering type using LEDs light source.
   2. Each Detector: Remote LEDs output and built-in test switch.
   3. Provide on twist-lock base.
   4. Perform calibrated sensitivity and performance test on detector without need for generation of smoke. Test method shall test all detector circuits.
   5. Visual Indication of Alarm: Provide by dual-latching LEDs on detector, seen from ground level over 360 degrees. LEDs shall flash every 10 seconds, indicating power is applied to detector.
   6. Detector shall not go into alarm or trouble when exposed to air velocities of up to 3,000 feet (914.4 m) per minute.
   7. Detector Screen and Cover Assembly: Easily removable for field cleaning of detector chamber.
   8. Field-Wire Connections: Made to base through use of clamping plate and screw.

P. Conventional Ionization-Type Smoke Detectors:
   1. 2-wire, 24-VDC type using dual uni-polar chamber.
   2. Each Detector: Remote LEDs output and built-in test switch.
   3. Provide on twist-lock base.
   4. Perform calibration sensitivity and performance test on detector without need for generation of smoke.
   5. Visual Indication of Alarm: Provide by dual-latching LEDs over 360 degrees, on detector, seen from ground level. LEDs shall flash every 10 seconds, indicating power is applied to detector.
   6. Detector shall not alarm or trouble when exposed to air velocities of up to 1,200 feet (365.76 m) per minute.
   7. Detector Screen and Cover Assembly: Easily removable for field cleaning of detector chamber.
   8. Field-Wire Connections: Made to base through use of clamping plate and screw.

Q. Sprinkler Waterflow Switches (provided and installed by the sprinkler contractor):
   1. Integral, mechanical, non-coded, non-accumulative retard type.
   2. Alarm transmission delay time conveniently adjustable from 0 to 60 seconds. Initial settings shall be 30 to 45 seconds.
   3. Single manufacturer and series.
   4. Where possible, locate waterflow switches a minimum of 1 foot from fitting which changes direction of flow and a minimum of 3 feet from valve.

5. Waterflow switches shall be provided and connected under this section but installed by the mechanical contractor.

R. Sprinkler and Standpipe Valve Supervisory Switches (provided and installed by the sprinkler contractor):
1. Each sprinkler system water supply control valve riser, zone control valve, and standpipe system riser control valve shall be equipped with supervisory switch. Standpipe hose valves, test valves, and drain valves shall not be equipped with supervisory switches.
2. PIV (Post Indicator Valve) or Main Gate Valves: Equip with supervisory switch.
3. Mount not to interfere with normal operation of valve and adjust to operate within 2 revolutions toward closed position of valve control, or when stem has moved no more than one-fifth of distance from normal position.
4. Contain in weatherproof aluminum housing, which shall provide 3/4-inch (19-mm) conduit entrance and incorporate necessary facilities for attachment to valves.
5. Switch Housing Finish: Red baked enamel.
6. Entire Installed Assembly: Tamper proof and arranged to cause switch operation if housing cover is removed or if unit is removed from mounting.
7. Valve supervisory switches shall be provided and connected under this section and installed by mechanical contractor.

2.8 SYSTEM PERIPHERALS – E3 SERIES

A. Graphic Annunciator (Uses ANU-48 Serial Driver Board):
1. Communicate to fire alarm control panel via EIA-485 (multi-drop) 2-wire communications loop. Up to 16 annunciator drivers, each configured up to 48 points, shall be connected per SLP panel locally, or up to 3,000 feet from the Control Panel.
2. ANU-48: Provide interface to approved UL-listed graphic-style LED annunciator and provide each of the features specified.

B. Auxiliary Switch Module (ASM-16):
1. Each ASM-16 has 16 programmable push-button switches.
2. Each push-button switch has 3 associated status LEDs (red, yellow, and green), configurable to indicate any combination of functions.
3. Flexible switch configurations to allow auxiliary functions.
4. An insertable label to identify function of each switch and LEDs combination.
5. Provide capability to communicate with up to 16 ASM-16 modules locally, or up to 3,000 feet from the Control Panel.

C. LCD Display Annunciator:
1. Furnish and install as indicated on the Drawings a remote serial annunciator, Model LCD-7100. Annunciator shall provide 80-character display, which shall duplicate all information on basic system display, including any network nodes its host panel is annunciating, with exception of menus. Contain the following function keys:
   a. Alarm Acknowledge.
   b. Trouble Acknowledge.
   c. Signal Silence.
   d. System Reset/Lamp Test.
   e. System Drill Test.
2. Key Lock: Enable switches only when placed in “ON” position, with exception of Trouble Acknowledge, which is used to silence local trouble audible sounder. Annunciator shall contain the following LEDs:

a. Alarm.
b. Supervisory.
c. System Trouble.
d. Power Fault.
e. System Silenced.

3. Mount on standard 3-gang surface or flush electrical box.
4. Each ILI-MB-E3/ILI95-MB-E3: Accommodate up to 5 remote LCD-7100 annunciators which shall be located up to 3,000 feet from control panel.

D. NGA Network Graphic Annunciator
1 Main Menu
a. Configure allows Auto-configuration of ILI-MB-S/ and ILI95-MB-E3/ILI95-S-E3 and NGA or ANX.
b. Walk/Drill enables Walk Test and Fire Drill function.
c. I/O Allows enable/disable input and output devices.
d. Clock system real-time clock.
e. View system configuration information
f. NGA log displays, stores, prints and clears the 4100 event history log.
g. Service provides Network Query functions.
h. (More spec items – Text messaging, custom logo, custom screensaver, max amount of text on screen at one time)

E. Horns:
1. Operate on 24 VDC or with field-selectable outputs.
2. Have two selectable tone options of temporal 3 and non-temporal continuous pattern.
3. Have at least 2 audibility options

F. Strobes:
1. Compliance: ADA and UL 1971.
2. Maximum Pulse Duration: 0.2 second.
3. Strobe Intensity: UL 1971.
4. Flash Rate: UL 1971.
5. Strobe Candela Rating: Determine by positioning selector switch on back of device.

G. Horn/Strobes:
1. Operate on 24 VDC
2. Have two selectable tone options of temporal 3 and non-temporal continuous pattern.
3. Have at least 2 audibility options
4. Maximum Pulse Duration: 0.2 second.
5. Strobe Intensity: UL 1971.
6. Flash Rate: UL 1971.
7. Strobe Candela Rating: Determine by positioning selector switch on back of device.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas and surfaces to receive fire alarm system.
1. Notify Architect of conditions that would adversely affect installation or subsequent use.
2. Do not begin installation until unacceptable conditions are corrected.

3.2 INSTALLATION

A. Install fire alarm system in accordance with NFPA 72, NFPA 70, state and local codes, manufacturer's instructions, and as indicated on the Drawings.

B. Conceal conduit, junction boxes, and conduit supports and hangers in finished areas. Conceal or expose conduit, junction boxes, and conduit supports and hangers in unfinished areas.

C. Do not install smoke detectors before system programming and test period. If construction is ongoing during this period, take measures to protect smoke detectors from contamination and physical damage.

D. Flush-mount fire detection and alarm system devices, control panels, and remote annunciators in finished areas. Flush-mount or surface-mount fire detection and alarm system devices, control panels, and remote annunciators in unfinished areas.

E. Ensure manual stations are suitable for surface mounting or semi-flush mounting as indicated on the Drawings. Install not less than 42 inches, not more than 48 inches, above finished floor measured to operating handle.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Provide service of competent, factory-trained technician authorized by manufacturer to technically supervise and participate during pre-testing and acceptance testing of system.

B. Testing:
   1. Conduct complete visual inspection of control panel connections and test wiring for short circuits, ground faults, continuity, and insulation before energizing cables and wires.
   2. Close each sprinkler system control valve and verify proper supervisory alarm at Control Panel.
   3. Verify activation of flow switches.
   4. Open initiating device circuits and verify that trouble signal actuates.
   5. Open signaling line circuits and verify that trouble signal actuates.
   6. Open and short notification appliance circuits and verify that trouble signal actuates.
   7. Ground initiating device circuits and verify response of trouble signals.
   8. Ground signaling line circuits and verify response of trouble signals.
   9. Ground notification appliance circuits and verify response of trouble signals.
   10. Check installation, supervision, and operation of intelligent smoke detectors.
   11. Introduce on system each of the alarm conditions that system is required to detect. Verify proper receipt and proper processing of signal at Control Panel and correct activation of control points.
   13. Consult manufacturer's manual to determine proper testing procedures when system is equipped with optional features. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality, and similar.

C. Acceptance Testing:
   1. Before installation shall be considered completed and acceptable by AHJ, a complete test using as a minimum, the following scenarios shall be performed and witnessed by

representative approved by Engineer. Monitoring company and/or fire department shall be notified before final test in accordance with local requirements.

2. Contractor's job foreman, in presence of representative of manufacturer, representative of Owner, and fire department shall operate every installed device to verify proper operation and correct annunciation at control panel.
3. Open signaling line circuits and notification appliance circuits in at least 2 locations to verify presence of supervision.
4. When testing has been completed to satisfaction of both Contractor's job foreman and representatives of manufacturer and Owner, a notarized letter co-signed by each attesting to satisfactory completion of said testing shall be forwarded to Owner and fire department.
5. Leave fire alarm system in proper working order and, without additional expense to Owner, replace defective materials and equipment provided within 1 year (365 days) from date of final acceptance by the owner.

3.4 DEMONSTRATION

A. Provide instruction as required for operating fire alarm system.

B. Provide hands-on demonstrations of operation of fire alarm system components and functions.

END OF SECTION

SECTION 311000

SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Stripping and stockpiling rock.
6. Removing above- and below-grade site improvements.
7. Disconnecting, capping or sealing, and removing site utilities, abandoning site utilities in place.
8. Temporary erosion and sedimentation control.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for temporary erosion- and sedimentation-control measures.
2. Section 015639 – Temporary Tree and Plant Protection
3. Section 015713 – Temporary Erosion and Sediment Control
4. Section 312000- Earth Moving

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 MATERIAL OWNERSHIP

A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.4 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.

B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

E. Tree- and Plant-Protection Zones: Protect according to requirements in Section 015639 "Temporary Tree and Plant Protection."

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed according to requirements in Section 015639 "Temporary Tree and Plant Protection."

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

A. Protect trees and plants remaining on-site according to requirements in Section 015639 "Temporary Tree and Plant Protection."

B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be

relocated that are damaged by construction operations according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.4 EXISTING UTILITIES

A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.

1. Arrange with utility companies to shut off indicated utilities.

B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Engineer not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Engineer's written permission.

C. Removal of underground utilities is included in earthwork sections; in applicable fire suppression, plumbing, HVAC, electrical, communications, electronic safety and security, and utilities sections; and in Section 024116 "Structure Demolition" and Section 024119 "Selective Demolition."

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Grind down stumps and remove roots larger than 3 inches in diameter, obstructions, and debris to a depth of 18 inches below exposed subgrade.
2. Use only hand methods or air spade for grubbing within protection zones.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depth indicated on Drawings, of 6 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and

necessary to facilitate new construction.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION

SECTION 312000

EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Excavating and filling for rough grading the Site.
2. Preparing subgrades for slabs-on-grade,pavements, turf and grasses, and, plants.
3. Excavating and backfilling for buildings and structures.
4. Drainage course for concrete slabs-on-grade.
5. Subbase course for concrete walks, pavements.
6. Subbase course and base course for asphalt paving.
7. Excavating and backfilling trenches for utilities and pits for buried utility structures.

1.2 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, will be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other fabricated stationary features constructed above or below the ground surface.

I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct preexcavation conference at Project site.

1.4 INFORMATIONAL SUBMITTALS

A. Material Test Reports:

1.5 FIELD CONDITIONS

A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth-moving operations.

B. Do not commence earth-moving operations until plant-protection measures specified in Section 015639 "Temporary Tree and Plant Protection" are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D2487, Groups A-1, A-2-4, A-2-5, and A-3 according to AASHTO M 145, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D2487, Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7 according to AASHTO M 145, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent

passing a No. 200 sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

1. Arkansas Highway and Transportation Department Class 7 Aggregate Base Course (ABC)

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

H. Drainage Course: Narrowly graded mixture of washedcrushed stone, or crushed or uncrushed gravel; ASTM D448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.

2.2 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:

B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

1. To comply with local practice or requirements of authorities having jurisdiciton.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

B. Protect and maintain erosion and sedimentation controls during earth-moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.3 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Pile Foundations: Stop excavations 6 to 12 inches above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.4 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.5 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: 12 inches each side of pipe or conduit.

C. Trench Bottoms:

1. Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

a. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.6 SUBGRADE INSPECTION

A. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer, without additional compensation.

3.7 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.8 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.9 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 033000 "Cast-in-Place Concrete."

D. Trenches under Roadways: Provide 4-inch- thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase course. Concrete is specified in Section 0321313 "Concrete Pavement"."

E. Initial Backfill:

1. Soil Backfill: Place and compact initial backfill of subbase material, satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.

a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

F. Final Backfill:

1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.

G. Warning Tape:

1. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.10 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

3.11 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.12 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D698, ASTM D1557:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.13 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1 inch.
3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.14 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:

1. Shape subbase course and base course to required crown elevations and cross-slope grades.
2. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
3. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D698, ASTM D1557.

3.15 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

1. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
2. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D698.

3.16 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Engineer.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.17 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or

partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION

SECTION 312116

TRENCHING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Section Includes:

1. Excavating trenches for piped utilities.

B. Related Sections:

1. Section 312000 "Earthwork" for backfilling and compaction of utility trenches.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:

1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
3. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
4. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
5. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
6. ASTM D6938 - 10 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

1.3 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, or cable.

1.4 SUBMITTALS

A. Section 013000 – Administrative Requirements: Requirements for submittals.

B. Excavation Protection Plan: Describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations to support plan.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with all applicable codes, and City of Wynne Ordinances.

1.6 QUALIFICATIONS

A. Prepare excavation protection plan under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Arkansas.

1.7 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.8 COORDINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 - PRODUCTS
PART 3 - EXECUTION

3.1 LINES AND GRADES

A. Lay pipes to lines and grades indicated on Drawings.

1. Engineer reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.

B. Use laser-beam instrument with qualified operator to establish lines and grades.

3.2 PREPARATION

A. Call “One Call”, the local utility information service at 811 not less than three (3) working days before performing Work.

1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum locations.

C. Protect plant life, lawns, and other features remaining as portion of final landscaping.

D. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

E. Maintain and protect above and below grade utilities indicated to remain.

F. Establish temporary traffic control and detours when trenching is performed in public right-of-way. Relocate controls and reroute traffic as required during progress of Work.

3.3 TRENCHING

A. Excavate subsoil required for utilities to utility service.

B. Remove lumped subsoil, boulders, and rock up of 1/6 of a cubic yard measured by volume. Remove larger material as specified in Section 312000 as rock excavation.

C. Perform excavation within 24 inches of existing utility service and in accordance with utility's requirements.

D. Do not advance open trench more than 200 feet ahead of installed pipe.

E. Cut trenches sufficiently wide to enable installation and allow inspection. Remove water or materials that interfere with Work.

F. Excavate bottom of trenches maximum 2 feet wider than outside diameter of pipe.

G. Excavate trenches to depth indicated on Drawings. Provide uniform and continuous bearing and support for bedding material and pipe utilities.

H. Do not interfere with 45 degree bearing splay of foundations.

I. When Project conditions permit, slope side walls of excavation starting 2 feet above top of pipe. When side walls cannot be sloped, provide sheeting and shoring to protect excavation as specified in this section.

J. When subsurface materials at bottom of trench are loose or soft, excavate to greater depth as directed by notify Engineer, and request instructions.

K. Cut out soft areas of subgrade not capable of compaction in place. Backfill with satisfactory fill material as defined in Section 312000, Earthwork and compact to density equal to or greater than requirements for subsequent backfill material.

L. Trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.

M. Correct over excavated areas with compacted backfill as specified for authorized excavation or replace with satisfactory fill as directed by Engineer.

N. Remove excess subsoil not intended for reuse, from site.

3.4 SHEETING AND SHORING

A. Sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.

B. Support trenches more than 5 feet deep excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.

C. Design sheeting and shoring to be removed at completion of excavation work.

D. Repair damage caused by failure of the sheeting, shoring, or bracing and for

settlement of filled excavations or adjacent soil.

E. Repair damage to new,and,existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

3.5 BACKFILLING

A. Backfill trenches to contours and elevations with unfrozen fill materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

C. Refer to Drawings and Section 312000, Earthwork for backfill procedure and materials for various pipe types.

D. Employ placement method that does not disturb or damage utilities in trench.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Do not leave more than 50 feet of trench open at end of working day.

G. Protect open trench to prevent danger to the public.

3.6 TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

3.7 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: Allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed. Basis of acceptance shall include but not be limited to compacted density performed as specified herein.

1. Perform field density tests in accordance with ASTM D 1556 (sand cone method), ASTM D 2167 (rubber balloon method) or ASTM D 6938.

B. If in the opinion of the Engineer, based on testing service reports and inspection, subgrade or fills that have been placed are below specified density, Contractor shall perform additional compaction and testing, at his expense, until specified density is obtained.

3.8 PROTECTION OF FINISHED WORK

A. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION

SECTION 312319

DEWATERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Construction dewatering.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 FIELD CONDITIONS

A. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of groundwater and permit excavation and construction to proceed on dry, stable subgrades.

PART 3 - EXECUTION

3.1 PREPARATION

A. Provide temporary grading to facilitate dewatering and control of surface water.

B. Protect and maintain temporary erosion and sedimentation controls, which are specified in Section 015000 "Temporary Facilities and Controls,",Section 311000 "Site Clearing," during dewatering operations.

3.2 INSTALLATION

A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.

1. Space well points or wells at intervals required to provide sufficient dewatering.
2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.

B. Place dewatering system into operation to lower water to specified levels before

excavating below groundwater level.

C. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

3.3 OPERATION

A. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.

B. Operate system to lower and control groundwater to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.

1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
2. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
3. Maintain piezometric water level a minimum of 24 inches below bottom of excavation.

C. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.

3.4 FIELD QUALITY CONTROL

A. Survey-Work Benchmarks: Resurvey benchmarks regularly during dewatering and maintain an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Architect if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

END OF SECTION

SECTION 315000

EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes temporary excavation support and protection systems.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 INFORMATIONAL SUBMITTALS

A. Contractor Calculations: For excavation support and protection system. Include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

B. Record Drawings: Identify locations and depths of capped utilities, abandoned-in-place support and protection systems, and other subsurface structural, electrical, or mechanical conditions.

1.4 FIELD CONDITIONS

A. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks, and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Provide, design, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting earth and hydrostatic pressures and superimposed and construction loads.

1. Design excavation support and protection system, including comprehensive engineering analysis by a qualified professional engineer.

PART 3 - EXECUTION

3.1 SOLDIER PILES AND LAGGING

A. Install steel soldier piles before starting excavation.

1. Extend soldier piles below excavation grade level to depths adequate to prevent lateral movement.
2. Space soldier piles at regular intervals not to exceed allowable flexural strength of wood lagging.
3. Accurately align exposed faces of flanges to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.

B. Install wood lagging within flanges of soldier piles as excavation proceeds.

1. Trim excavation as required to install lagging.
2. Fill voids behind lagging with soil, and compact.

C. Install wales horizontally at locations indicated on Drawings and secure to soldier piles.

3.2 SHEET PILING

A. Before starting excavation, install one-piece sheet piling lengths and tightly interlock vertical edges to form a continuous barrier.

B. Accurately place the piling using templates and guide frames unless otherwise recommended in writing by the sheet piling manufacturer.

1. Limit vertical offset of adjacent sheet piling to 60 inches.
2. Accurately align exposed faces of sheet piling to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.

C. Cut tops of sheet piling to uniform elevation at top of excavation.

3.3 TIEBACKS

A. Drill, install, grout, and tension tiebacks.

B. Test load-carrying capacity of each tieback, and replace and retest deficient tiebacks.

1. Have test loading observed by a qualified professional engineer responsible for design of excavation support and protection system.

C. Maintain tiebacks in place until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.4 BRACING

A. Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.

1. Do not place bracing where it will be cast into or included in permanent concrete work unless otherwise approved by Architect.
2. Install internal bracing if required to prevent spreading or distortion of braced frames.
3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.5 FIELD QUALITY CONTROL

A. Survey-Work Benchmarks: Resurvey benchmarks regularly during installation of excavation support and protection systems, excavation progress, and for as long as excavation remains open.

1. Maintain an accurate log of surveyed elevations and positions for comparison with original elevations and positions.
2. Promptly notify Architect if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

3.6 REMOVAL AND REPAIRS

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and earth and hydrostatic pressures.

1. Remove in stages to avoid disturbing underlying soils and rock or damaging structures, pavements, facilities, and utilities.
2. Remove excavation support and protection systems to a minimum depth of 48 inches below overlying construction, and abandon remainder.

END OF SECTION

SECTION 320523

CONCRETE FOR EXTERIOR IMPROVEMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. Related Sections:

1. 312000 – EARTH MOVING

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement.

D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Material certificates.

C. Material test reports.

D. Floor surface flatness and levelness measurements.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
2. Manufacturer shall provide concrete mix designs stamped and sealed by a licensed professional Engineer licensed in the State of Arkansas.

B. Testing Agency Qualifications: An independent agency, approved by Owner and Engineer qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Testing Agency shall be managed by a licensed professional engineer

licensed in the State of Arkansas.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."

D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

E. Concrete Testing Service: Engage and provide a qualified independent testing agency to perform material evaluation tests and to sample and test concrete mixtures.

F. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.2 STEEL REINFORCEMENT

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 , deformed.

1. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class I or Class II, as approved, zinc coated after fabrication and bending.
2. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M, epoxy coated, with less than 2 percent damaged coating in each 12-inch bar length.

C. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

D. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

E. Galvanized-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from galvanized-steel wire into flat sheets.

F. Epoxy-Coated Welded Wire Reinforcement: ASTM A 884/A 884M, Class A coated, Type 1, plain or deformed steel, as approved.

G. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in

place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice.

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I or Type II gray. Supplement with the following:

a. Fly Ash: ASTM C 618, Class F or C.
b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33, graded.

1. Maximum Coarse-Aggregate Size: 1 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

2.4 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 WATERSTOPS

A. Flexible Rubber Waterstops: CE CRD-C 513,with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

B. Chemically Resistant Flexible Waterstops: Thermoplastic elastomer rubber waterstops with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints; resistant to oils, solvents, and chemicals. Factory fabricate corners, intersections, and directional changes.

C. Flexible PVC Waterstops: CE CRD-C 572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

D. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

E. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 inch.

2.6 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

B. Sheet Vapor Retarder-1: Polyethylene sheet, ASTM D 4397, not less than 10 mils thick.

2.7 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq.yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

F. Clear, Waterborne, Membrane-Forming Curing Compound-1: ASTM C 309, Type 1, Class B, non-dissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

G. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

1. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

H. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

1. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.8 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

2.9 CONCRETE MIXTURES

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Concrete mixture designs shall be stamped and signed by a registered professional Engineer registered in the State of Arkansas.

B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.

C. Admixtures: Use admixtures with approval from Engineer and according to manufacturer's written instructions.

1. Use water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

D. Proportion normal-weight concrete trail and pavement mixture as follows:

1. Minimum Compressive Strength: 3500 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 4 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
4. Air Content: 5.0 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.

E. Proportion normal-weight concrete bridge pier, abutment and structure mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 4 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
4. Air Content: 5.0 percent, plus or minus 1.5 percent at point of delivery for1-inchnominal maximum aggregate size.

2.10 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.11 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix and deliver concrete according to

ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 fours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Chamfer exterior corners and edges of permanently exposed concrete.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.5 JOINTS

A. Coordinate joint types, description, and location with Drawings. Joint types have been consolidated in this article for consistency rather than for strict sequence of installation.

B. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

C. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

D. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch . Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8 inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

E. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

F. Waterstops: Install in construction joints and at other joints indicated according to manufacturer's written instructions.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Concrete shall not be placed on top of mud, standing water, ice, trash, debris or anything other than the specified subbase material.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

D. Cold-Weather Placement: Comply with ACI 306.1.

E. Hot-Weather Placement: Comply with ACI 301.

3.7 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.

1. Apply scratch finish to surfaces indicated.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces indicated.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated.
2. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding,10-ft- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

3.9 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq.ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.10 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

3.11 FIELD QUALITY CONTROL

A. Testing and Inspecting: Engage and provide a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Sample concrete materials for slump, temperature and strength testing as required by ACI 301.

C. Provide one (1) set of concrete tests for each 50 cubic yards of material or fraction thereof.

D. Concrete test samples shall include four concrete cylinders for strength testing; one to be tested at 7 day, two to be tested at 28 day, and one spare to be tested at 56 days as required.

END OF SECTION

SECTION 321123

AGGREGATE BASE COURSE

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Aggregate base course for Portland cement or asphalt concrete paving.

1.2 RELATED SECTIONS

A. Section 312000: Earthwork

B. Section 32126: Asphalt Pavement

C. Section 321313: Concrete Pavement

1.3 REFERENCES

A. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).

B. ASTM D1557 – Test Methods for Moisture – Density Relations of Soils and Soil-Aggregate Mixtures Using 10lb (4.54 Kg) Rammer and 18 inch (457 mm) Drop.

C. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.

D. ASTM D6938 - 10 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

PART 2 - PRODUCTS

2.1 MATERIALS

A. Class 7 Base Course: Crushed stone base material with the following gradation:

1. Sieve (mm): 3” (75); Class 7 Percent Passing: N/A
2. Sieve (mm)-1: 2” (50); Class 7 Percent Passing: N/A
3. Sieve (mm)-2: 1-1/2” (37.5); Class 7 Percent Passing: 100
4. Sieve (mm)-3: 1” (25.0); Class 7 Percent Passing: 60-100
5. Sieve (mm)-4: 3/4” (19.0); Class 7 Percent Passing: 50-90
6. Sieve (mm)-5: 3/8” (9.5); Class 7 Percent Passing: N/A
7. Sieve (mm)-6: #4 (4.75); Class 7 Percent Passing: 25-55
8. Sieve (mm)-7: #10 (2.00); Class 7 Percent Passing: N/A
9. Sieve (mm)-8: #40 (0.425); Class 7 Percent Passing: 10-30
10. Sieve (mm)-9: #200 (0.075); Class 7 Percent Passing: 3-10

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify substrate has been inspected, gradients and elevations are correct, and is

dry.

3.2 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

B. Do not place fill on soft, muddy, or frozen surfaces

3.3 AGGREGATE PLACEMNT

A. Spread aggregate over prepared substrate to a maximum compacted thickness of 6 inches per lift.

B. Level and contour surfaces to elevations and gradients indicated.

C. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

D. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.4 TOLERANCES

A. Flatness: Maximum variation of ¼ inch measured with 10 foot (3 m) straight edge.

B. Scheduled Compacted Thickness: Within ¼ inch.

C. Variation From Design Elevation: Within ½ inch.

3.5 FIELD QUALITY CONTROL

A. Compaction testing will be performed in accordance with ASTM D1557 and ASTM D6938, as indicated.

B. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

C. Frequency of Tests: One per lift per 2,500 square feet or as otherwise recommended by the Geotechnical Engineer.

END OF SECTION

SECTION 321216

ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hot-mix asphalt paving.

B. Related Sections:

1. Section 321123 "Aggregate Base Course" for aggregate subbase and base courses.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

1. Job-Mix Design: For each job mix proposed for the Work.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates:

1. For each paving material, from manufacturer

1.4 QUALITY ASSURANCE

A. Allowable Tolerances:

1. Subgrade after fine grading:

a. Shall not vary more than 0.05 feet from plan elevation.

2. Aggregate base:

a. Shall not vary more than 0.05 feet from plan elevation.

3. Asphalt concrete hot mix binder course:

a. Shall not vary more than 0.04 feet from the plan elevation.
b. Shall not vary more than 0.04 feet from specified thickness.

4. Asphalt concrete hot mix wearing course:

a. Shall not vary more than 0.03 feet from the plan elevation.
b. Shall not vary more than 0.02 feet from specified thickness.
c. Shall not vary more than 0.015 feet from the edge of a 10 foot straight edge laid thereon parallel to or at right angles to the direction of paving.

5. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

a. Test and Design Mix Criteria:

1) Contractor, at his expense, shall employ the services of an independent testing laboratory to perform tests and design mixes. Materials and mix designs shall be approved at least 10 days before starting of construction

a) Aggregate tests (Aggregate Base Course):
b) The material to be used for the aggregate base course shall conform to Section 321123, Aggregate Base Course.
c) Preliminary job mix formula (Asphalt Concrete Hot Mix Surfacing):
d) A preliminary job mix formula shall be developed for the asphalt concrete hot mix surfacing material in accordance with AASHTO MP 2 or equal to AHTD requirements.
e) Resubmit a new job mix formula for OWNER'S approval if it becomes necessary to change the source of aggregates or when unsatisfactory results or other conditions warrant a change in mixture requirements.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:

1. Tack Coat: Minimum surface temperature of 60 deg F.
2. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. Coarse Aggregate: ASTM D692/D692M, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.

B. Fine Aggregate: AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.

C. Mineral Filler: AASHTO M 17, rock or slag dust, hydraulic cement, or other inert material.

2.2 ASPHALT MATERIALS

A. Asphalt Bitumen for Binder Course and Surface Course: AASHTO M 320, PG 76-22

B. Bituminous Track Coat: CSS-1, CSS-1h, RC-70, MC-250, or OWNER approved equal.

2.3 MIXES

A. Hot-Mix Asphalt: Each mix design shall be prepared by laboratory analysis. Each mix design will establish a mix gradation for the aggregates (based on the weight of material passing specified screen sizes), an optimum asphalt binder content (expressed as a percentage of the total mix weight), an optimum laboratory mixing temperature, and an optimum laboratory compaction temperature. Optimum laboratory mixing and compaction temperatures shall be established based on temperature-viscosity curves of the asphalt binder to be used in the mix. The optimum asphalt content is the asphalt binder content at 4% Air Voids (AV) for PG 76-22 mixes and 4.5% Air Voids (AV) for PG 64-22 and PG 70-22 mixes. The mix design will be designed in accordance with the volumetric mix design procedures contained in AASHTO MP 2 and its referenced standards or equal to AHTD specified mix designs.

PART 3 - EXECUTION

3.1 SUBGRADE PREPARATION

A. Fine grade and compact subgrade to the plan cross section. Compaction shall be as specified in Section 312000.

B. After compaction, cut-out soft spots and unstable areas in the subgrade and fill with granular fill as defined in Section 312000 and compact as specified in Section 312000.

3.2 AGGREGATE BASE

A. Where required, construct the aggregate base as shown on Drawings on the prepared subgrade as soon as possible after final shaping and compaction of the subgrade is completed.

B. Construction requirements shall be compacted to a density of at least 95 percent as defined by ASTM D1557 (Modified Proctor).

C. Density tests shall be taken as specified in Section 312000 and no bituminous layer shall be applied on the aggregate base course until it is approved by OWNER.

3.3 BITUMINOUS TACK COAT

A. Apply a bituminous tack coat to an existing bituminous surface if it has been dirtied by traffic or by other means just before constructing another bituminous course. The face of all concrete surfaces to which the bituminous surface will come in contact with shall be sprayed or painted with tack oil.

3.4 BITUMINOUS BINDER COURSE

A. Construct a plant mixed bituminous binder course as shown on Drawings using a mechanical paver.

3.5 BITUMINOUS WEARING COURSE

A. Construct a plant mixed bituminous wearing course as shown on Drawings using a mechanical paver.

3.6 FIELD QUALITY CONTROLS

A. From time to time during progress of the work and/or upon completion of the work, OWNER may require that testing be performed to determine that materials provided for the work and its installation meets the specified requirements.

3.7 DEFECTIVE WORK

A. When tests and inspections of the aggregate base and/or bituminous work indicate non-compliance with the Specification, Contractor and OWNER shall mutually agree on the number and location of additional tests to define and/or verify the deficiency. If the average of the tests for a given area indicate non-compliance, the area is considered defective and Contractor shall:

1. Remove and replace defective work at no cost to OWNER;
2. Correct the work at no cost to OWNER in a manner acceptable to OWNER; or
3. Give OWNER a credit towards the Contract Price if said credit is acceptable to OWNER.

3.8 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
3. Offset transverse joints, in successive courses, a minimum of 24 inches.
4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method in accordance with AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."

3.9 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to

the following density:

1. Average Density, Rice Test Method: 92 percent of reference maximum theoretical density in accordance with ASTM D2041/D2041M, but not less than 90 percent or greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

G. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Replace and compact hot-mix asphalt where core tests were taken.

END OF SECTION

SECTION 321313

CONCRETE PAVING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Furnish and construct all exterior portland cement concrete as shown on Drawings and herein specified.

1. Work to be included under this Section shall consist of the following:

a. Driveways, fire access lanes, dumpster approach, sidewalks, and any concrete pavement specified on the drawings.

B. Related Work Specified Elsewhere:

1. Section 312000: Earthwork
2. Section 321216: Asphalt Pavement

1.2 QUALITY ASSURANCE

A. Qualifications of Installers:

1. Provide at least 1 person at all times during execution of this portion of Work and who is thoroughly familiar with the type of materials being installed and is directly responsible for all Work performed under this Section.

B. Requirements of Regulatory Agencies:

1. It is Contractor's responsibility to comply with the requirements of the regulatory agencies, including the purchase of any permits at their own expense.

C. Construction Tolerances:

1. Vertical alignment shall not vary more than 1/8 inch from the edge of a 10-foot straight edge.
2. Horizontal alignment shall not vary more than 1/2 inch from the plan alignment for pavement.
3. Concrete thickness shall not be less than specified.
4. Reinforcing bars shall be placed to the following tolerances:

a. Clear distance to formed surface, plus or minus ¼ inch.
b. Sheared length, plus or minus 1 inch.
c. Concrete cover on top bars in slabs and beams 8 inches deep or less, 2 inches plus or minus 1/4 inch.
d. Concrete cover on top bars in members 8 inches to 24 inches deep, 2 inches plus or minus 1/2 inch.
e. Crosswise or lengthwise spacing, plus or minus 2 inches provided minimum spacing and cover requirements are not violated.

D. Referenced Standards:

1. The current editions of the following American Concrete Institute (ACI) publications shall govern all Work performed hereunder, unless otherwise specified:

a. Recommended Practice for Concrete Floor and Slab Construction - ACI 302.
b. Recommended Practice for Hot Weather Concreting – ACI 305.
c. Recommended Practice for Cold Weather Concreting - ACI 306.
d. Recommended Practice for Construction of Concrete Pavements and Concrete Bases - ACI 316.
e. Building Code Requirements for Reinforced Concrete - ACI 318.

E. Design Criteria:

1. Contractor shall employ an approved independent materials testing laboratory and pay for the service of setting up the design mixes and to analyze the fine and coarse aggregate for the various uses of concrete utilized on the project. Design mixes shall be in accordance with the previously cited ACI 318 publication and in compliance with this Specification. The proposed mixes shall be submitted to OWNER for approval prior to placing of any concrete. The approved mixes established by the laboratory shall be used in the Work as long as the characteristics of the ingredients remain unchanged. If any significant change is made in the ingredients, new mixes shall be prepared and submitted to OWNER for approval.
2. Concrete shall consist of a minimum 28 day compressive design strength of 4,000 psi using portland cement, aggregate, air entraining admixture, water and an air content ranging from 5 to 7 percent. Slump of concrete shall have a range of 2 to 4 inches.

a. If any of the conditions vary from those as described, Contractor shall submit a revised mix design prepared by the testing laboratory along with a written request for the variance desired to OWNER for their consideration and approval.
b. Concrete for portions of the structure required to be watertight, such as water storage, pumpstation wetwells and waste treatment tanks, shall be air-entrained and have a water-cement ratio not exceeding 0.48.
c. Admixtures shall be used only with the approval in writing by OWNER. All admixtures shall be used in accordance with the manufacturer's instructions and shall be added at the plant. Calcium chloride shall not be used as an admixture.
d. Mix designs shall be based on Type I cement. Type III (high early) cement or any other types of cement shall be used only when approved in writing by OWNER. When high-early cement is used, the 7-day strength test shall exceed the specified 28-day strength tests.

1.3 SUBMITTALS

A. Product Data:

1. Prepare and submit product data for OWNER'S approval. Product data

shall include manufacturer's recommended installation instructions.

B. Samples:

1. If requested by OWNER, submit samples for approval of proposed materials.

C. Certification:

1. Submit 3 copies of certification of material compliance as requested by OWNER.

D. Delivery Tickets:

1. Submit a delivery ticket with each truck load of concrete delivered which indicates OWNER'S design mix, truck number, project number, Contractor, ready mix producer, time of batching and total yards of concrete.

E. Test Reports and Design Mixes:

1. Submit 3 copies of design mixes and material test reports to OWNER.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Form Material:

1. Form material shall be either sound lumber or steel, free of defects and variations in dimensions. The sides of all lumber shall be surfaced and matched to prevent mortar leakage. Metal forms shall be of standard manufacture and need not be new, but shall be free from rust and dirt. Metal forms shall be flat and true to line without punctures. All form material shall be sized and of strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal of same.

a. Rigid forms are to be utilized on tangent alignment and curves having a radius of 150 feet or greater.
b. Curved forms shall be utilized on the curved Work with a radius of 150 feet or less, and shall consist of flexible spring steel or laminated lumber.

B. Reinforcement Materials:

1. Reinforcing bars and dowels shall be of new billet steel conforming to ASTM A615, Grade 60 (60,000 psi yield). Sizes of bars shall be as indicated on Drawings or herein specified.

a. Dowel bars when used for contraction and expansion joints shall be smooth steel bars coated with a thin uniform coating of liquid asphalt (MC-250) or grease on 1/2 the length of the bar plus 2 inches. In addition, dowel bars for expansion joints shall be furnished with end caps designed with one end closed, a minimum length of 3 inches and be positioned to allow bar movement of not less than 1 inch.

b. Dowel bar assemblies may be permitted if fabricated to the width of the pavement section.
c. Tie bars for control, longitudinal and construction joints shall be deformed bars.

C. Concrete Materials:

1. Portland cement shall conform to ASTM C150.

a. Cement shall be a low alkali cement (Type I) containing not more than 0.6 percent by weight of tri-sodium silicate oxide.

2. Coarse aggregate shall conform to Size 57 grade requirements of Table 2 of ASTM C33 standard.
3. Fine aggregate shall conform to ASTM C33 with fineness modulus not to vary more than 0.20 from value assumed in design mix.
4. Water shall be potable, clean and free from deleterious amounts of acid, alkali or organic material.

D. Admixtures:

1. Air entraining agent shall conform to ASTM C260 and shall be added at the mixer.
2. Water reducing agents, (such as super plasticizers), retarding agents, accelerating agents and all other admixtures, shall require approval by OWNER and if used, shall conform to ASTM C494. In no case shall admixtures be permitted as substitute for cement content specified, unless approved by OWNER.

E. Expansion Joint Material:

1. Joint filler material shall consist of a non-extruding standard bituminous bound type "Sealtight Asphalt Expansion Joint" as manufactured by W.R. Meadows, Inc., Elgin, Illinois or OWNER approved equal.

a. Material shall conform to ASTM D994.

2. Joint filler material shall consist of preformed non-extruded bituminous bound type "Sealtight-Fibre Expansion Joint" as manufactured by W.R. Meadows, Inc., Elgin, Illinois; "Code 1390" as manufactured by W.R. Grace Company, Cambridge, Massachusetts or OWNER approved equal.

a. Material shall conform to ASTM D1751.
b. Material shall be 1/2 inch thick, unless otherwise noted, of widths equal to slab thickness less 1/2 inch or as otherwise indicated.

3. Joint sealant shall be a single component, polyurethane type "Sikaflex-la" as manufactured by Sika Chemical Corporation, Lyndhurst, New Jersey or OWNER approved equal. Color as selected by OWNER.

F. Curing Materials:

1. Kraft paper shall be waterproof and nonstaining "Sisalkraft 5K-10" conforming to ASTM C171.
2. Polyethylene film shall be white opaque sheet or roll material not less than

0.006 inch thick (6 mil) conforming to AASHTO-M171.

3. Contractor may at their option use a liquid curing compound for surfaces that will not receive treating oil or waterproofing membrane. Liquid curing compound shall conform to ASTM C309 and shall consist of the following:

   a. Type 1D, translucent with fugitive dye.
   b. Type 2, white pigmented, Class B (vehicle solids restricted to all resin).

2.2 PRODUCTION

A. Concrete shall be ready-mixed, and shall be batched, mixed and transported in accordance with "Specification for Ready-Mixed Concrete" ASTM C94. The production plant equipment and facilities shall meet the requirements of the National Ready Mixed Concrete Association.

PART 3 - EXECUTION

3.1 JOB CONDITIONS

A. Hot Weather Conditions:

1. The following precautions shall be adhered to:

   a. Reject concrete mixture having temperature of 85ºF or greater.
   b. Pre wet subgrade.
   c. Crushed or flaked ice may be utilized in reducing temperature of mixture.
   d. If necessary, reduce temperature of reinforcing steel with wet burlap.
   e. Reduce mixing time (agitating time) in truck to 45 minutes.
   f. During periods of high winds, shelter windward side with adequate wind breaks.
   g. Apply no chemical retarder to finished surface unless permission is granted in writing by OWNER.

B. Cold Weather Conditions:

1. When ambient temperature is 40ºF or less, the following precautions are to be adhered to:

   a. Subbase shall not be frozen.
   b. Concrete mixture delivered at Worksite shall be 55ºF (minimum), 85ºF (maximum).
   c. No calcium chlorides, salts or other chemical accelerators shall be permitted, unless otherwise acceptable in writing by OWNER.
   d. Concrete surface shall be maintained at a minimum of 50ºF with appropriate thermal insulation for a period of 7 days (normal concrete), 3 days (high early-strength concrete).
   e. Refer to previously cited ACI 306 for minimum thickness of thermal protection required.
   f. Any concrete that has frozen or disintegrated as a result of freezing shall be removed and replaced at Contractor's expense.

3.2 SUBGRADE PREPARTION

A. Fine grade and compact subgrade to the plan cross section. Compaction shall be as specified in Section 312000 of this Specification or as indicated on the Drawings.

B. After compaction, cut-out soft spots and unstable areas in the subgrade and fill with select fill material and compact as specified in Section 312000.

3.3 GRANULAR BASE

A. Construct the select fill and granular base as shown on Drawings on the prepared subgrade after the final shaping and compacting of the subgrade is completed.

B. Compact as specified base in Section 312000 of this Specification.

3.4 FORM CONSTRUCTION

A. Forms shall have the strength and rigidity, regardless of material, such that when they are set in place and braced, they will withstand weight of equipment and weight of concrete without settlement or lateral displacement.

B. Keyway forms in the edge of pavement slabs and at construction joints shall be constructed to the dimensions shown on Drawings. Wood keyway forms, if used, shall be bolted or nailed to the side forms. Metal keyway forms shall be fixed or held rigidly in place by staking or other OWNER approved method.

C. Forms shall be coated prior to the placement of concrete, with a nonstaining form release agent. Wooden form may be prewetted with water. No standing water, adjacent to forms, shall be permitted.

3.5 REMOVAL OF FORMS

A. Forms for slabs on grade shall not be removed earlier than 12 hours after the placement of concrete has been completed. Within 24 hours of form removal backfill adjacent to the pavement shall be completed.

B. Forms supporting the weight of concrete shall not be released until the concrete has reached its specified 28-day strength. Minimum time elapse after casting and before the false Work supports are released shall be 8 days for spans up to 96 inches center to center of supports, plus 1 additional day for each 12 inches of increase in span length over 84 inches up to 14 days for span of 14 feet and over. Such time period shall be exclusive of those time intervals during which the concrete surface temperature is below 40ºF. If temperature remains below 40ºF during the casting and curing period no forms shall be removed until approved field tests indicating adequate concrete strength have been provided.

3.6 REINFORCEMENT PLACEMENT

A. Tie bars, reinforcement bars and dowel bars shall be clean, free from rust and shall be placed on adequate supports in locations as shown on Drawings. Provide the following minimum thickness of concrete cover:

1. Concrete deposited on ground: 3 inches

2. Formed surfaces against ground: 1-1/2 inches
3. Beams, girders and columns: 1-1/2 inches
4. Slabs, walls and joists: 1 inch
5. Clear distance between parallel bars: 1 inch or nominal bar distance
6. For No. 6 bars or larger: 2 inches
7. No broken brick, block or concrete shall be permitted as reinforcement supports.

B. Welded steel wire fabric shall be placed free from rust, kinks and bends and shall be cut in such a way that the overlap measured between outermark cross wires of each fabric sheet is not less than 2 inches. The fabric shall be cut at contraction joints. It shall be supported by a layer of fresh concrete placed to the depth of the mesh shown on Drawings, followed by placement of the upper layer of concrete.

3.7 JOINTS

A. General:

1. Construct expansion, contraction and construction joints with face perpendicular to surface of concrete.
2. Where joining existing structures, match existing contraction or expansion joints.

B. Expansion Joints:

1. All fixed objects, such as buildings and structures or pavement, sidewalks or curb intersections shall be separated by a 1/2 inch expansion joint placed at the full depth of the concrete thickness. Expansion joints, in addition to the above, shall be placed at 60 foot intervals in the following:

a. Concrete curb and gutter
b. Concrete walk

C. Construction Joints:

1. Contraction joints shall be placed at the following intervals and dimensions or as shown on Drawings:

a. Concrete curb and gutter – 10 feet; 1/8 inch wide by 1 1/2 inch depth.
b. Concrete walk – 10 feet; 1/8 inch wide by 1/4 the depth of concrete.

2. Cut plastic concrete with appropriate tool to specified depth. Finish edges with 1/4 inch radius tool.
3. Saw-cut joints to specified width and depth on hardened concrete as soon as concrete has hardened sufficiently to prevent raveling or damage to the joint.

D. Joint Sealer:

1. Apply joint sealer to a clean and dry expansion or contraction joint if specified to a point approximately 1/4 inch below the top surface. Where oil treatment is specified, joint sealer shall be applied prior to application of the oil.

3.8 CONCRETE PLACEMENT

A. Place concrete to required depth and width to form a continuous mass requiring a minimum of rehandling. Concrete adjacent to side forms and fixed structures shall be consolidated by means of portable vibrators or by mechanical means with the use of hand spading. Vibrators shall not be used to move concrete horizontally.

B. If it is necessary to place a construction joint prior to a contraction joint, the distance between the construction joint and the previous contraction joint shall not be less than 60 inches.

C. Automatic machine may be used for curb and gutter placement at Contractor's option, if acceptable to OWNER. If machine placement is to be used, submit revised mix design and laboratory test results, which meet or exceed the minimum herein specified. Machine placement must produce curbs and gutters to the required cross-section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified.

3.9 CONCRETE FINISH

A. After initial strike-off and floating, and prior to finishing, test surface with 10-foot straightedge. Correct irregularities prior to final finishing operations.

B. Apply the following surface finish after surface sheen or excess moisture has disappeared:

1. Apply steel trowel finish followed by stiff-bristled broom drawn across concrete surfaces, perpendicular to line of traffic:

    a. Sidewalk
    b. Concrete pavement
    c. Curb and gutter

3.10 CONCRETE CURING AND PROTECTION

A. Cure concrete surfaces for 7 days (normal concrete) and for 3 days (high early-strength concrete), using appropriate means of protection as previously cited in ACI 305 and ACI 306.

B. Curing methods shall consist of one of the following:

1. Keep concrete surface continuously wet by ponding with water.
2. Apply moisture proof fabric to entire area lapping joints and edges at least 3 inches. Tape interior joints and weight edges down with sand or other approved material.
3. Apply liquid membrane curing compound to the finished surface in a 2 coat continuous operation with second application applied transversely to the direction of the first application, and in accordance with the manufacturer's directions. Replace damaged areas with equal applications of membrane using compound. Liquid membrane curing compound shall not be permitted where the surface will be subjected to an application of waterproof coatings, bonding agents, treating oil or paint.

3.11 TESTING AND EVALUATION

A. Concrete materials and operations shall be tested and inspected as the Work progresses, by an independent testing laboratory. Contractor shall furnish any necessary labor who is familiar with methods of sampling and shall assist the testing agency in obtaining and handling samples, and for safe storage and proper curing of concrete test specimens on Worksite.

B. Mold and cure three standard 6-inch diameter specimens from each sample in accordance with ASTM C31. Compressive strength test specimens shall be in accordance with ASTM C39. Two specimens shall be tested at 28 days for acceptance and one shall be tested at 7 days for information. The acceptance test results shall be the average of the strengths of the two specimens tested at 28 days. If one specimen in a test manifests evidence of improper sampling, molding or testing, it shall be discarded and the strength of the remaining cylinder shall be considered the test result. Should both specimens in a test show any of the above defects, the entire test shall be discarded. When high-early strength concrete is used, the first specimen shall be tested at 3 days; the remaining two at 7 days.

C. Make at least one strength test for each 50 cubic yards, or fraction thereof, of each mix design of concrete placed in any one day.

D. Determine slump of the concrete sample for each strength test and whenever consistency of concrete appears to vary, using standard slump cone as per ASTM C143.

E. The testing laboratory shall report all test and inspection results to OWNER, OWNER'S Engineer, and Contractor immediately after they are performed. All concrete test reports shall include name of job, date of placement, date of test, batch mix design, slump and the exact location in the Work at which the batch represented by the test was deposited.

F. All costs necessary to prepare concrete test cylinders, make tests and furnishing of written reports shall be borne by the Contractor.

3.12 DEFECTIVE WORK

A. When tests and inspections of the aggregate base and/or concrete Work indicate non-compliance with the Specification, Contractor and OWNER shall mutually agree on the number and location of additional tests to define and/or verify the deficiency. If the average of the tests for a given area indicate non-compliance the area is considered defective and Contractor shall:

1. Remove and replace defective Work at no cost to OWNER;
2. Correct the Work at no cost to OWNER in a manner acceptable to OWNER;
3. Give OWNER a credit towards the Contract Price if it is acceptable to OWNER;
4. If Work is found to be in noncompliance, Contractor shall pay for the defective area removal and replacement, and the tests and inspection costs; or
5. If Work is found to be in compliance, OWNER shall pay for tests and inspection costs.

END OF SECTION

SECTION 321373

CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cold-applied joint sealants.
2. Hot-applied joint sealants.
3. Joint-sealant backer materials.
4. Primers.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: for each type of product

B. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of joint sealant.

C. Paving-Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Product certificates.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backer materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

2.2 COLD-APPLIED JOINT SEALANT

A. Single-Component, Nonsag, Silicone Joint Sealant: ASTM D 5893/D 5893M, Type NS.

B. Single-Component, Self-Leveling, Silicone Joint Sealant: ASTM D 5893/D 5893M, Type SL.

C. Multicomponent, Nonsag, Urethane, Elastomeric Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use T.

D. Single Component, Pourable, Urethane, Elastomeric Joint Sealant: ASTM C 920, Type S, Grade P, Class 25, for Use T.

E. Multicomponent, Pourable, Urethane, Elastomeric Joint Sealant: ASTM C 920, Type M, Grade P, Class 25, for Use T.

2.3 HOT-APPIED JOINT SEALANT

A. Hot-Applied, Single-Component Joint Sealant: ASTM D 6690, Type I.

B. Hot-Applied, Single-Component Joint Sealant ASTM D 6690, Type I or Type II.

C. Hot-Applied, Single-Component Joint Sealant ASTM D 6690, Type I, II, or III.

D. D 6690, Type IV.

2.4 JOINT-SEALANT BACKER MATERIALS

A. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

B. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.

C. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.5 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

PART 3 - EXECUTION

3.1 INSTALLATION OF JOINT SEALANTS

A. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Cleaning of Joints: Clean out joints immediately to comply with joint-sealant manufacturer's written instructions.

C. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer.

D. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions.

E. Install joint-sealant backers to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of joint-sealant backer materials.
2. Do not stretch, twist, puncture, or tear joint-sealant backer materials.
3. Remove absorbent joint-sealant backer materials that have become wet before sealant application and replace them with dry materials.

F. Install joint sealants immediately following backer material installation, using proven techniques that comply with the following:

1. Place joint sealants so they fully contact joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

G. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants in accordance with the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:

1. Remove excess joint sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

H. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

I. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.

END OF SECTION

SECTION 321400

UNIT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete pavers.
2. Curbs and edge restraints.

B. Related Requirements:

1. Section 321313 "Concrete Paving" for concrete base under unit pavers,and,for cast-in-place concrete curbs and gutters serving as edge restraints for unit pavers.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For the following:

a. Pavers.
b. Edge restraints.
c. Precast concrete curbs.

B. Sieve Analyses: For aggregate setting-bed materials, according to ASTM C136.

C. Samples for Initial Selection: For each type of unit paver indicated and the following:

1. Joint materials involving color selection.
2. Exposed edge restraints involving color selection.
3. Precast concrete curbs.

D. Samples for Verification: For full-size units of each type of unit paver indicated. Include Samples of the following:

1. Joint materials.
2. Exposed edge restraints.
3. Precast concrete curbs.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Material Certificates: For unit pavers. Include statements of material properties indicating compliance with requirements, including compliance with standards. Provide for each type and size of unit.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified unit paving installer. Installer's field supervisor must have Concrete Paver Installer Certification from the Interlocking Concrete Pavement Institute (ICPI) with one of the following designations:

1. Commercial Paver Technician Designation.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store pavers on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

1.6 FIELD CONDITIONS

A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.

B. Weather Limitations for Mortar and Grout:

1. Cold-Weather Requirements: Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
2. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6. Provide artificial shade and windbreaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F and higher.

a. When ambient temperature exceeds 100 deg F , or when wind velocity exceeds 8 mph and ambient temperature exceeds 90 deg F , set pavers within 1 minute of spreading setting-bed mortar.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain each type of unit paver, joint material, and setting material from single source with resources to provide materials and products of consistent quality in appearance and physical properties.

2.2 CONCRETE PAVERS

A. Concrete Pavers, Solid Interlocking Paving Units: Complying with ASTM C936/C936M, made from normal-weight aggregates.

1. Thickness: As indicated.
2. Face Size and Shape:

    a. As indicated.

3. Color: As indicated.

2.3 CURBS AND EDGE RESTRAINTS

A. Job-Built Concrete Edge Restraints: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mixed concrete with minimum 28-day compressive strength of 3000 psi .

2.4 AGGREGATE SETTING-BED MATERIALS

A. Graded Aggregate for Subbase: Sound, crushed stone or gravel complying with requirements in Section 312000 "Earth Moving" for subbase material.

B. Graded Aggregate for Base: Sound, crushed stone or gravel complying with requirements in Section 312000 "Earth Moving" for base course.

C. Sand for Leveling Course: Sound, sharp, washed, natural sand or crushed stone complying with gradation requirements in ASTM C33/C33M for fine aggregate.

D. Sand for Joints: Fine, sharp, washed, natural sand or crushed stone with 100 percent passing No. 16 sieve and no more than 10 percent passing No. 200sieve.

1. Provide sand of color needed to produce required joint color.

E. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications; made from polyolefins or polyesters, with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2, AASHTO M 288.
2. Apparent Opening Size: No. 60 sieve, maximum; ASTM D4751.
3. Permittivity: 0.02 per second, minimum; ASTM D4491.
4. UV Stability: 50 percent after 500 hours' exposure, ASTM D4355.

F. Drainage Geotextile: Nonwoven needle-punched geotextile fabric, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2, AASHTO M 288.
2. Apparent Opening Size: No. 40 sieve, maximum; ASTM D4751.
3. Permittivity: 0.5 per second, minimum; ASTM D4491.
4. UV Stability: 50 percent after 500 hours' exposure, ASTM D4355.

G. Herbicide: Commercial chemical for weed control, registered with the EPA. Provide in granular, liquid, or wettable powder form.

2.5 MORTAR AND GROUT MIXES

A. Mortar-Bed Bond Coat: Mix neat cement and water to a creamy consistency.

B. Portland Cement-Lime Setting-Bed Mortar: Type M complying with ASTM C270, Proportion Specification.

C. Thinset Mortar Bond Coat: Proportion and mix according to manufacturer's written instructions.

D. Job-Mixed Portland Cement Grout: Proportion and mix job-mixed portland cement and aggregate grout to match setting-bed mortar except omit hydrated lime and use enough water to produce a pourable mixture.

E. Packaged Grout: Proportion and mix according to grout manufacturer's written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces indicated to receive unit paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Where unit paving is to be installed over waterproofing, examine waterproofing installation, with waterproofing Installer present, for protection from paving operations, including areas where waterproofing system is turned up or flashed against vertical surfaces.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.

B. Sweep concrete substrates to remove dirt, dust, debris, and loose particles.

3.3 INSTALLATION, GENERAL

A. Do not use unit pavers with chips, cracks, voids, discolorations, or other defects that might be visible or cause staining in finished work.

B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.

C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.

1. For concrete pavers, a block splitter may be used.

D. Handle protective-coated brick pavers to prevent coated surfaces from contacting backs or edges of other units. If, despite these precautions, coating does contact bonding surfaces of brick, remove coating from bonding surfaces before setting brick.

E. Joint Pattern: As indicated.

F. Tolerances:

1. Do not exceed 1/4 in 10 feet from level, or indicated slope, for finished surface of paving.

G. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.

1. Install edge restraints to comply with manufacturer's written instructions. Install stakes at intervals required to hold edge restraints in place during and after unit paver installation.
2. For metal edge restraints with top edge exposed, drive stakes at least 1 inch below top edge.
3. Install job-built concrete edge restraints to comply with requirements in Section 033000 "Cast-in-Place Concrete."
4. Where pavers set in mortar bed are indicated as edge restraints for pavers set in aggregate setting bed, install pavers set in mortar and allow mortar to cure before placing aggregate setting bed and remainder of pavers. Cut off mortar bed at a steep angle so it will not interfere with aggregate setting bed.
5. Where pavers embedded in concrete are indicated as edge restraints for pavers set in aggregate setting bed, install pavers embedded in concrete and allow concrete to cure before placing aggregate setting bed and remainder of pavers. Hold top of concrete below aggregate setting bed.

3.4 AGGREGATE SETTING-BED APPLICATIONS

A. Place separation geotextile as indicated over prepared subgrade, overlapping ends and edges at least 12 inches.

B. Place aggregate subbase and base, compact to 100 percent of ASTM D1557 maximum laboratory density, and screed to depth indicated.

C. Place drainage geotextile over compacted base course, overlapping ends and edges at least 12 inches.

D. Place leveling course and screed to a thickness of 1 to 1-1/2 inches, taking care that moisture content remains constant and density is loose and uniform until pavers are set and compacted.

E. Treat leveling course with herbicide to inhibit growth of grass and weeds.

F. Set pavers with a minimum joint width of 1/16 inch and a maximum of 1 /8 inch being careful not to disturb leveling base. If pavers have spacer bars, place pavers hand tight against spacer bars. Use string lines to keep straight lines. Fill gaps between units that exceed 3/8 inch with pieces cut to fit from full-size unit

pavers.

1. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.

G. Spread dry sand and fill joints immediately after vibrating pavers into leveling course. Vibrate pavers and add sand until joints are completely filled, then remove excess sand. Leave a slight surplus of sand on the surface for joint filling.

H. Do not allow traffic on installed pavers until sand has been vibrated into joints.

I. Repeat joint-filling process 30 days later.

3.5 REPAIRING, POINTING, AND CLEANING

A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.

B. Pointing: During tooling of joints, enlarge voids or holes and completely fill with grout. Point joints at sealant joints to provide a neat, uniform appearance, properly prepared for sealant application.

C. Cleaning: Remove excess grout from exposed paver surfaces; wash and scrub clean.

1. Remove temporary protective coating as recommended by coating manufacturer and as acceptable to paver and grout manufacturers.

END OF SECTION

SECTION 321443

POROUS UNIT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete Unit Pavers:

a. Solid concrete pavers for porous paving.

B. Related Requirements:

1. Section 312000 "Earth Moving" for excavation and compacted subgrade.
2. Section 321313 "Concrete Paving" for cast-in-place concrete curbs that serve as edge restraints for porous paving.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For materials other than aggregates.
2. For the following:

a. Pavers.
b. Precast concrete curbs.
c. Geotextiles.

B. Sieve Analyses: For aggregate materials, according to ASTM C136.

C. Samples:

1. Full-size units of each type of unit paver indicated.
2. Precast concrete curbs.
3. Aggregate fill.
4. Aggregate setting bed materials.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Material Certificates: For unit pavers. Include statements of material properties indicating compliance with requirements, including compliance with standards. Provide for each type and size of unit.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified porous unit paving installer. Installer's field supervisor shall have Concrete Paver Installer Certification from the Interlocking Concrete Pavement Institute (ICPI) with PICP (Permeable Interlocking Concrete Pavement) Specialist Designation.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store pavers on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.

B. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

PART 2 - PRODUCTS

2.1 CONCRETE UNIT PAVERS

A. Source Limitations: Obtain each type of paver from single source that has resources to provide materials and products of consistent quality in appearance and physical properties.

B. Solid Concrete Pavers for Porous Paving: Solid interlocking paving units of shapes that provide openings between units, complying with ASTM C936/C936M, resistant to freezing and thawing when tested according to ASTM C67, and made from normal-weight aggregates.

1. Thickness: As indicated.
2. Face Size and Shape: As indicated.
3. Color: As selected by Architect from manufacturer's full range.

2.2 AGGREGATE SETTING-BED MATERIALS

A. Graded Aggregate for Subbase: Sound crushed stone or gravel complying with requirements in Section 312000 "Earth Moving" for subbase material.

B. Graded Aggregate for Base Course: Sound crushed stone or gravel complying with requirements in Section 312000 "Earth Moving" for base-course material.

C. Graded Aggregate for Leveling Course: Sound crushed stone or gravel complying with ASTM D448 for Size No. 8.

D. Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured according to test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Apparent Opening Size: No. 40 sieve, maximum; ASTM D4751.
3. Permittivity: 0.5 per second, minimum; ASTM D4491.
4. UV Stability: 50 percent after 500 hours' exposure; ASTM D4355.

PART 3 - EXECUTION

3.1 PREPARATION

A. Proof-roll prepared subgrade according to requirements in Section 312000 "Earth Moving" to identify soft pockets and areas of excess yielding. Proceed with porous paver installation only after deficient subgrades have been corrected and are ready to receive subbase andbase course for porous paving.

3.2 INSTALLATION, GENERAL

A. Do not use unit pavers with chips, cracks, voids, discolorations, and other defects that might be structurally unsound or visible in finished work.

B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.

C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.

D. Tolerances:

1. Variation in Plane between Adjacent Units (Lipping): Do not exceed 1/16-inch unit-to-unit offset from flush.
2. Variation from Level or Indicated Slope: Do not exceed 1/8 inch in 24 inches and 1/4 inch in 10 feet or a maximum of 1/2 inch.

E. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.

1. Install edge restraints to comply with manufacturer's written instructions. Install stakes at intervals required to hold edge restraints in place during and after porous paver installation.
2. For metal edge restraints with top edge exposed, drive stakes at least 1 inch below top edge.

F. Provide curbs as indicated. Install curbs before placing unit pavers.

1. Install precast concrete curbs on aggregate-base course after placing and compacting base course for pavers.

3.3 INSTALLATION OF SETTING-BED

A. Place drainage geotextile over prepared subgrade, overlapping ends and edges at least 12 inches.

B. Place aggregate base, compact to 100 percent of ASTM D1557 maximum laboratory density, and screed to depth indicated.

C. Place leveling course, and screed to a thickness of 2 to 2-1/2 inches, taking care that moisture content remains constant and density is loose and constant until pavers are set and compacted.

3.4 INSTALLATION OF PAVERS

A. Set unit pavers on leveling course, being careful not to disturb leveling base. If pavers have lugs or spacer bars to control spacing, place pavers hand tight against lugs or spacer bars. If pavers do not have lugs or spacer bars, place pavers with a 1/16-inch- minimum and 1/8-inch- maximum joint width. Use string lines to keep straight lines. Fill gaps between units that exceed 3/8 inch with pieces cut to fit from full-size pavers.

1. When installation is performed with mechanical equipment, use only unit pavers with lugs or spacer bars on sides of each unit.

B. Compact pavers into leveling course with a low-amplitude plate vibrator capable of a 3500- to 5000-lbf compaction force at 80 to 90 Hz. Use vibrator with neoprene mat on face of plate or other means as needed to prevent cracking and chipping of pavers. Perform at least three passes across paving with vibrator.

1. Compact pavers when there is sufficient surface to accommodate operation of vibrator, leaving at least 36 inches of uncompacted pavers adjacent to temporary edges.
2. Before ending each day's work, compact installed concrete pavers except for 36-inch width of uncompacted pavers adjacent to temporary edges (laying faces).
3. As work progresses to perimeter of installation, compact installed pavers that are adjacent to permanent edges unless they are within 36 inches of laying face.
4. Before ending each day's work and when rain interrupts work, cover pavers that have not been compacted and leveling course on which pavers have not been placed with nonstaining plastic sheets to protect them from rain.

C. Place graded aggregate fill immediately after vibrating pavers into leveling course. Spread and screed aggregate fill level with tops of pavers.

1. Before ending each day's work, place aggregate fill in installed porous paving except for 42-inch width of unfilled paving adjacent to temporary edges (laying faces).
2. As work progresses to perimeter of installation, place aggregate fill in installed paving that is adjacent to permanent edges unless it is within 42 inches of laying face.
3. Before ending each day's work and when rain interrupts work, cover paving that has not been filled with nonstaining plastic sheets to protect it from rain.

D. As work progresses, remove and replace pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.

END OF SECTION

SECTION 321723

PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Painted markings applied to asphalt paving.
2. Painted markings applied to concrete paving and surfaces.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design".

B. Markings Standards: Comply with applicable MUTCD current Standards.

2.2 PAVEMENT MARKING PAINT

A. MPI #97, latex traffic-marking paint.

1. Asphalt Application

a. Color: White or approved equal.

2. Concrete Application

a. Color: White or approved equal.

3. Fire Lane Application

a. Color: Pantone 484 C or approved equal.

4. ADA Application Colors:

a. Pantone 7691 C or approved equal.
b. White or approved equal (asphalt).
c. White or approved equal (concrete).

B. Glass Beads: AASHTO M 247, Type 1.

2.3 PAVEMENT MARKING THERMOPLASTIC

A. All public rights of way shall receive thermoplastic markings stipes. Color to be approved through submittal.

1. Color: White or Yellow

PART 3 - EXECUTION

3.1 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Allow asphalt paving or concrete surfaces to age for a minimum of 30 days before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to asphalt paving or concrete surface. Mask an extended area beyond edges of each stencil to prevent paint application beyond stencil. Apply paint so that it cannot run beneath stencil.
2. Broadcast glass beads uniformly into wet markings at a rate of 6 lb/gal.

END OF SECTION

SECTION 321813

SYNTHETIC GRASS SURFACING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Synthetic grass surfacing.

B. Related Requirements:

1. Section 312000 "Earth Moving" for preparation, compaction, and grading of granular base.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Synthetic grass surfacing.

B. Shop Drawings: For synthetic grass surfacing.

1. Include sections and details.
2. Show locations of seams and method of seaming.

C. Samples: For each type of synthetic grass surfacing indicated.

1. Turf Fabric: 12 inch square.
2. Infill Material: of each type.
3. Seam Sample: 24 inch square with seam centered in sample.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each synthetic grass surfacing assembly.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For synthetic grass surfacing, including maintenance cleaning instructions, to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Turf Fabric: Minimum of 300 sq. ft. for each type indicated.
2. Infill: Minimum of two bags of each type.
3. Seaming Tape and Adhesive: One roll of seaming tape and one gallon of adhesive.
4. One new set of maintenance tools, of type recommended by synthetic grass surfacing manufacturer for installation.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials in location and manner to allow installation of synthetic grass surfacing without excess disturbance of granular base.

1.8 WARRANTY

A. Refer to manufacturer's specifications for warranty information and period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Turf Fabric: Turf fabric tested in accordance with the following methods, with additional test method conditions for each method in accordance with ASTM F1551.

1. Tuft Bind: Not less than 8 lbf in accordance with ASTM D1335.
2. Breaking Strength: Minimum 200 lbf in warp direction and minimum 200 lbf perpendicular to warp direction, in accordance with ASTM D5034.

B. Permeability: 16-20 i of rainfall capacity in accordance with ASTM F2898 or EN 15330-1.

C. Durability: Minimum of 10,000 wear cycles in accordance with EN 15306 (Lisport test).

2.2 SYNTHETIC GRASS SURFACING

A. Turf Fabric: Woven turf fabric with multicolored fiber and UV resistance, complying with the following:

1. Yarn Fiber: Monofilament polyethylene.
2. Lead Content of Yarn Fiber: Maximum of 100 ppm in accordance with ASTM F2765.
3. Pile Weight: As indicated in accordance with ASTM D5848.
4. Pile Height: As indicated in accordance with ASTM D5823.

B. Backing: Manufacturer's standard woven or nonwoven polypropylene primary backing with urethane-coated secondary backing; provide perforations or drainage channels sufficient to meet permeability indicated.

C. Infill: Manufacturer's standard sand and rubber infill.

D. Seaming Method: Adhesive.

2.3 MATERIALS

A. Rubber Infill: Ground SBR crumb rubber mesh free of metal, nonmetal fibers, and contaminants; mesh size as recommended by synthetic grass surfacing manufacturer.

B. Sand Infill: Uniformly sized silica sand free of silts, clays, and contaminants, and of subangular or rounder shape in accordance with ASTM F1632; mesh size as recommended by synthetic grass surfacing manufacturer.

C. Seam Adhesive: One- or two-part urethane, recommended or approved by synthetic grass surfacing manufacturer, and suitable for ambient conditions at time of installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine base and other conditions, with Installer present, for compliance with requirements for installation tolerances, permeability, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF SYNTHETIC GRASS SURFACING

A. Avoid disturbance of base during installation of shock-attenuation pad andturf fabric.

B. Roll out turf fabric and allow to relax at least four hours prior to seaming.

C. Provide seams flat and snug, with no gaps or fraying. Remove yarns that are trapped within seams. Attach turf fabric to perimeter restraint system as recommended by the manufacturer.

D. Repair loose seams and bubbles formed due to expansion of turf fabric prior to installation of infill.

E. Evenly broadcast and groom infill by machine in proportions and depth after settling as recommended by the manufacturer, and to meet indicated performance requirements. Rake fibers trapped by infill to surface.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections:

1. Permeability: **16-20 i** of rainfall capacity in accordance with ASTM F2898 or EN 15330-1.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel in proper maintenance procedures for synthetic grass surfacing.

END OF SECTION

SECTION 32 31 13
CHAIN-LINK FENCES AND GATES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Chain link fences and gates.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM)
   1. ASTM A 392 - Zinc-Coated Steel Chain-Link Fence Fabric
   2. ASTM C 94 - Ready-Mixed Concrete

B. Chain Link Fence Manufacturers Institute (CLFMI) latest edition Product Manual

1.03 SUBMITTALS

A. Manufacturer's installation instructions.

B. Shop Drawings

C. Project Record Documents: Accurately record actual locations of property perimeter posts relative to property lines and easements.

1.04 QUALITY ASSURANCE

A. Chain link fabric, posts, and components, and installation shall conform to the requirements of the CLFMI Product Manual unless otherwise shown or specified.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum 3 years documented experience.

PART 2 - PRODUCTS

2.01 MATERIALS

A. All fencing and gates to be coated with black PVC.

B. Steel Posts: Type I or II or roll formed "C" Section steel conforming to CLFMI and as specified hereinafter.

C. Fabric: No. 9 gage (0.148 nominal) galvanized steel wire in 2 inch mesh; ASTM A 392, top and bottom selvages knuckled, height as shown. Furnish 1-piece fabric widths.

D. End, Corner, and Pull Posts: Minimum sizes and weights as follows.

E. Up to 13 Foot Fabric Height: Type I or II in accordance with CLFMI Product Manual.

F. 13 foot and over Fabric Height (If required):
   1. Type I Posts: Round; 4.0 inch outside diameter pipe, 9.10 lbs/lin ft. b. Type II Posts: 4.0 inch outside diameter pipe, 6.56 lbs/lin ft E. Line (Intermediate) Posts: Minimum sizes and weights as follows.
      a. Up to 8 Foot Fabric Height: Type I, II, or "C" Section in accordance with CLFMI Product
         1) Manual.
      b. Over 8 Foot Fabric Height:
         1) Type I Posts:
            (a) Round: 2.875 inch outside diameter pipe, 5.79 lbs/lin ft.
            (b) Square: 2.5" x 2.5" outside dimension, 5.10 lbs/lin ft.
         2) Type II Posts: 2.875 inch outside diameter pipe, 4.64 lbs/lin ft. F. Gate Posts: Type I or II in accordance with CLFMI Product Manual.
   2. Top, Bottom, and Intermediate Rails: Type I or II in accordance with CLFMI Product Manual.
      a. Manufacturer's longest lengths.
      b. Couplings: Expansion type, approximately 6 inches long.

c. Attaching Devices: Means of attaching top rail securely to each gate, corner, pull, and end post.

3. Sleeves: Galvanized steel pipe not less than 6-inches long with inside diameter not less than ½ inch greater than outside diameter of pipe. Provide steel plate closure welded to bottom of sleeve of width and length not less than 1 inch greater than outside diameter of sleeve.
4. Tension Wire: 7 gage galvanized steel conforming to CLFMI, Marcelled, located at bottom of fabric.
5. Wire Ties: Class 1 galvanized steel, no less than 9 gage.
6. Post Brace Assembly: Manufacturer's standard adjustable brace at end of gate posts and at both sides of corner and pull posts, with horizontal brace located at mid-height of fabric. Use same material as top rail for brace, and truss to line posts with 0.375-inch diameter rod and adjustable tightener.
7. Post Tops: Galvanized steel, weather tight closure cap for each tubular post. Furnish caps with openings to permit passage of top rail.
8. Stretcher Bars: Galvanized steel, 1 piece lengths equal to full height of fabric, with minimum cross-section of 3/16-inch x 3/4-inch. Provide one stretch bar for each gate and end post, and two for each corner and pull post.
9. Stretch Bar Bands: Manufacturer's standard
10. Gate Cross-bracing: 3/8-inch diameter galvanized steel adjustable length truss rods. P. Ready Mix Concrete: ASTM C94, mix design as follows:
    a. Design mix to produce normal weight concrete consisting of Portland cement, aggregate,
        1) water-reducing admixture, air-entraining admixture, and water to produce following:
        2) Compressive Strength: 3,500 psi, minimum at 28 days, unless otherwise indicated on Construction Drawings.
        3) Slump Range: 1 to 3 inches at time of placement c. Air Entrainment: 5 to 8 percent
11. Water: Clean
12. Swinging Gate Hardware:
    a. Hinges: Size and material to suit gate size, non-lift-off type, offset to permit full 180-degree gate opening. Provide a pair of 1 1/2-inch hinges for each leaf over 6'-0" nominal height.
    b. Lock: Securitron GL-1 Gate Lock with power supply.
    c. Entry device: Card reader mounted on aluminum gooseneck pedestal.
    d. Exit Device: Push button mounted on aluminum gooseneck pedestal.
    e. Closer: Lockey TB 200 Hydraulic closer.
13. Double Gates Hardware: Provide gate stops for double gates, consisting of mushroom type of flush plate with anchors set in concrete, to engage center drop rod or plunger bar. Include lock- ing device and padlock eye as integral part of latch, using 1 padlock for locking both gate leaves.
14. Sliding Gate Hardware: Provide manufacturer's standard heavy-duty track, ball-bearing hanger sheaves, overhead framing and supports, guides, stays, bracing, and accessories as required.
15. Slide Gate
    a. Gate shall be cantilever sliding type, complete with latches, stops, keepers, rollers and roller tracks. Gate frames and posts shall consist of galvanized steel pipe. The fabric shall be of the same material as used in the fence. The gate shall be to the dimensions as shown on the plans.
    b. Automatic cantilever slide gate shall be constructed so as to extend across the opening as specified on the plans. The height of the gates shall be as shown on the plans. Gate type shall conform to details as shown on the plans. The sag and deflection of the slide gates shall not exceed the values presented in ASTM F 1184, Type II, Class 2.

c. The gate shall be fabricated from aluminum alloy extrusions. The gate frame shall be reinforced or post-tensioned with galvanized tubular steel running through the full length of the top and bottom primary members. The primary members shall be oversized rectangular members, top member nominally 3” by 5”, bottom member nominally 2” by5”. Vertical members at the ends of the frame and at 2’ centers, end to end, shall be square, not less than 1” by 1”. Spacing of vertical members shall be no greater than half the height of the gate frame. Diagonal bracing shall be installed to further stabilize the gate frame. Gate frames shall be modular sections.
d. The gate frame shall have a separate semi-enclosed top track of extruded aluminum alloy, which becomes an integral part of, and forms a composite structure with the top of the gate frame. This gate frame shall be supported by two self-aligning, 4-wheel, sealed lubricant, ball bearing truck assemblies riding in the semi-enclosed track. The bottom of the support posts shall be equipped with two pairs of rubber guide wheels.
e. The automatic slide gates shall be equipped with a standard latch assembly consisting of post mount catcher and frame-mounted yoke. A mating eyelet on the catcher yoke and the frame yoke intended for a padlock to secure the gate shall be included.
f. The rear of the gate shall be supported in the open position.

2.02 GATE FABRICATION

A. Fabricate swing gate perimeter frames of 1.90-inch OD pipe, galvanized steel. Provide horizontal and vertical members to ensure proper gate operation and attachment of fabric, hardware, and accessories. Space frame members maximum of 8'-0" apart.

B. Assemble gate frames by welding or special fittings and rivets, for rigid connections. Install same fabric as for fence with stretcher bars at vertical edges. Install diagonal cross-bracing on gates as required ensuring rigid frame without sag or twist. Bars may be used at top and bottom edges. Attach stretchers to gate frame at 15 inches o.c. maximum.

C. Attach hardware to provide security against removal or breakage.

2.03 FINISH

A. Fabric, Framing, and Other Iron Parts: Hot dip zinc coated in accordance with CLFMI Product
1. Manual.

2.04 FENCE GROUNDING

A. Conductors: Bare, solid wire for No. 6 AWG and smaller; stranded wire for No. 4 AWG and larger.
1. Material above Finished Grade: Copper.
2. Material on or below Finished Grade: Copper.
3. Bonding Jumpers: Braided copper tape, 1 inch wide, woven of No. 30 AWG bare copper wire, terminated with copper ferrules.

B. Connectors and Grounding Rods: Comply with UL 467.
1. Connectors for Below-Grade Use: Exothermic welded type.
2. Grounding Rods: Copper-clad steel, 5/8 by 96 inches.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install chain link fence in accordance with CLFMI Product Manual unless otherwise specified herein.

B. Comply with recommended procedures and instructions of fencing manufacturer. Provide secure, aligned installation with line posts spaced at 10'-0" o.c. maximum.

C. Methods for Setting Posts:
1. Grade-Set Posts:
a. Drill or hand excavate to a depth approximately 3 inches lower than post bottom.
1) Set post bottom not less than 36 inches below finish grade.

(a) Excavate each post hole to 12 inch diameter, or not less than four times diameter of post.
(b) Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and fin-
(1) ishing operations. Extend concrete footing 2-inches above grade and trowel crown to shed water.
(c) Post shall be set plumb within 1/4" in 10 feet.

2) Sleeve Set Posts: Anchor posts by means of pipe sleeves preset and anchored into con- crete. After posts have been inserted into sleeves, fill annular space between post and sleeve solid with nonshrink, non-metallic grout, mixed and placed to comply with grout manufacturer's directions.

b. Top Rails: Run rail continuously, bending to form radius for curved runs. Provide expansion couplings as recommended by manufacturer.
c. Center Rails: Provide center rails where indicated. Install in 1 piece between posts and flush with post on fabric side, using special offset fittings where necessary.
d. Brace Assemblies: Install braces so posts are plumb when diagonal rod are under proper ten- sion.
e. Tension Wire: Install tension wires through post cap loops before stretching fabric and tie to each post cap with not less than 6 gauge galvanized wire. Fasten fabric to tension wire using 11 gauge galvanized steel hog rings spaced 24-inches o.c.
f. Fabric: Leave approximately 2 inches between finish grade and bottom selvage. Pull fabric taut and tie to posts, rails, and tension wires. Install fabric on security side of fence, and anchor to framework so that fabric remains in tension after pulling force is released.
g. Stretcher Bars: Secure at end, corner, pull, and gate posts by threading through or clamping to fabric at 4 inches o.c. and secure to posts with metal bands spaced at 15 inches o.c.
h. Tie Wires:
1) Use U-shaped wire, conforming to diameter of pipe to which attached, clasping pipe and fabric firmly when ends twisted at least 2 full turns. Bend ends of wire to minimize haz- ard to persons or clothing.
2) Tie fabric to line posts with wire ties spaced 12 inches o.c. Tie fabric to rails and braces with wire ties spa
3) Manufacturer's standard procedure will be accepted if of equal strength and durability.
i. Fasteners: Install nuts for tension bands and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.
j. Gates: Install gates plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubrica- tion.

3.02 ADDITIONAL INSTALLATION PROVISIONS

A. Use U-shape tie wires, conforming to the diameters of pipe, that clasp the pipe and fabric firmly with ends twisted at least 2 full turns.

B. Bend ends of exposed wires to minimize hazards to persons or clothing.

C. Install nuts for fasteners on tension bands and hardware bolts on the side of the fence opposite the fabric. The ends of bolts, once secure and checked for smooth operation, shall be peened to prevent removal of nuts.

D. Repair coatings damaged in the field with methods and techniques as recommended by the manufacturer.

3.03 GROUNDING AND BONDING

A. Fence Grounding: Install at maximum intervals of 1500 feet except as follows:

1. Fences within 100 Feet of Buildings, Structures, Walkways, and Roadways: Ground at maximum intervals of 750 feet.
    a. Gates and Other Fence Openings: Ground fence on each side of opening.
    b. Bond metal gates to gate posts.
        1) Bond across openings, with and without gates, except openings indicated as intentional fence discontinuities. Use No. 2 AWG wire and bury it at least
        2) 18 inches below finished grade.

B. Protection at Crossings of Overhead Electrical Power Lines: Ground fence at location of crossing and at a maximum distance of 150 feet on each side of crossing.

C. Fences Enclosing Electrical Power Distribution Equipment: Ground as required by IEEE C2 unless otherwise indicated.

D. Grounding Method: At each grounding location, drive a grounding rod vertically until the top is
1. 6 inches below finished grade. Connect rod to fence with No. 6 AWG conductor. Connect conductor to each fence component at the grounding location, including the following:
2. Make grounding connections to each barbed wire strand with wire-to-wire connectors designed for this purpose.
3. Make grounding connections to each barbed tape coil with connectors designed for this purpose.

E. Bonding Method for Gates: Connect bonding jumper between gate post and gate frame.

F. Connections: Make connections to minimize possibility of galvanic action or electrolysis.
1. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
2. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
3. Make connections with clean, bare metal at points of contact.
4. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
5. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
6. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

G. Bonding to Lightning Protection System: If fence terminates at lightning-protected building or structure, ground the fence and bond the fence grounding conductor to lightning protection down conductor or lightning protection grounding conductor complying with NFPA 780.

3.04 ADJUSTING

A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Lubricate hardware and other moving parts.

3.05 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's personnel to adjust, operate, and maintain chain-link fences and gates.

END OF SECTION

SECTION 328400

LANDSCAPE IRRIGAITON PERFORMANCE SPECIFICAITON

PART 1 - GENERAL

1.1 DESCRIPTION

A. It is the intent of this Specification that a finished system is complete in every respect and shall be ready for operation satisfactory to the Landscape Architect and Owner. The design is to be delegated by the contractor and approved by the Landscape Architect

B. The work shall include all materials, labor, services, transportation, and equipment necessary to perform the work as indicated in these Specifications, and as necessary to complete the contract Section 321123 "Aggregate Base Course" for aggregate subbase and base courses.

C. Section Includes:

1. Pipe and fittings, valves, outlets, backflow preventer, and accessories.
2. Connection to utilities and meter installation.
3. Automatic control system

1.2 REFERENCES, DEFINITIONS AND APPLICABLE STANDARDS

A. ASTM D 1785 - Poly Vinyl Chloride (PVC) Plastic Pipe (SDR-PR)

B. ANSI/ASTM D 2564 - Solvent Cement for Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings.

C. Reference and comply with applicable plumbing codes, standards, or specifications by building code or governing utility authority for the project location.

D. Rain Bird Irrigation Installation Details and Specifications.

E. Irrigation Main Piping: Downstream from point of connection to water distribution piping to, and including, control valves. Piping is under water-distribution-system pressure.

F. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50V or for remote control, signaling power-limited circuits.

G. Notice of Completion: The date at the close of the Maintenance Period when the work has been completed, checked, accepted, and written approval of the work has been given by the Architect.

H. Date of Acceptance: The date at the end of the warranty periods as specified herein, and written acceptance has been given by the Architect.

I. Finish Grade: Elevation of finished surface of planting soil within 1/10th of an inch

1.3 GENERAL DESIGN SYSTEM REQUIREMENTS

A. Contractor's delegated design for an automatic 2-wire system, electric valve, irrigation system with 100 percent coverage and minimal over spray onto buildings and paved surfaces to meet the following design standards:

1. Compliance with all applicable plumbing codes for the project location.
2. Irrigation water meter and tap to be provided as part of the irrigation system. Meter size and location to be determined by contractor’s system design and coordination with owner and general contractor.
3. General Contractor to provide irrigation system sleeving under pavement crossings at the locations and sizes shown in the irrigation shop drawings. Coordinate with General Contractor to provide any additional sleeves that may be necessary.
4. Provide backflow preventer assembly with insulated housing. Provide automatic controller, control wiring, and hardwired connections to power source. Coordinate controller location with owner, general contractor and electrical contractor.
5. Provide wireless rain and heat sensor device to shut off, delay, and adjust watering cycle times.
6. Pipe sizing must provide for a maximum velocity of 5 feet per second and must provide adequate pressure delivery at all heads for proper performance.
7. Provide separate valve zones for turf and planted bed areas.
8. Provide pop-up spray and/or rotor type outlets for turf areas.
9. Space spray and/or rotor type outlets to provide near 100% overlapped coverage between each outlet.
10. Provide drip irrigation for planted bed areas.
11. Provide drip pop up indicators at all drip areas.
12. Provide additional drip emitters for trees in drip zone areas.
13. Coordinate the locations of controller and backflow preventers to minimize visibility and screen with landscape materials where possible.
14. Piping to be located along back of curbs, pavement edges, and bed edges.
15. Spray from perimeter of areas where feasible.
16. Provide 100% coverage of all newly planted landscape areas on site and in adjacent street rights-of-way and/or other areas as indicated in the Landscape Plan.
17. Provide manual drain valves and sumps, or piped connections to drainage system in sufficient locations to drain the entire system for winterizing.
18. Provide valve boxes and covers at all locations described. Align all valve boxes parallel or perpendicular to adjacent hardscape where applicable.
19. Minimize the number of outlets, trenching, and pipe installation where possible.

1.4 PRE-CONSTRUCTION SUBMITTALS

A. Contractor to provide a delegated design for a fully automated 2- wire irrigation system to be review and approved by the Landscape Architect through shop drawings.

B. Product Data:

1. Prior to ordering of any materials, and for each type of product indicated provide submittals for acceptance by the Landscape Architect. Include

rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

2. The submittals shall include the following information:

    a. A title sheet with the job name, the Contractor's name, address and telephone number, submittal date and submittal number.
    b. Shop Drawings with the following clearly indicated: Irrigation layout plan showing the sleeving locations, mainline routing, lateral line routing, controller location, meter location, backflow location and head or drip line locations.
    c. An index sheet showing the item number (i.e. 1, 2, 3, etc.); an item description (i.e. sprinkler head); the manufacturer's name (i.e. Rain Bird); the item model number (i.e. 44DLRC); and the page(s) in the submittal set that contain the catalog cuts.
    d. The catalog cuts shall clearly indicate the manufacturer's name and the item model number. The item model number, all specified options and specified sizes shall be circled or highlighted on the catalog cuts.
    e. Submittals for equipment shall contain the manufacturer, Class or Schedule, ASTM numbers and/or other certifications as indicated in these specifications.

3. Submittal format requirements:

    a. Submittals shall be provided as one complete package for the project. Multiple or partial submittal packages will not be reviewed.
    b. Submittal package shall be submitted as a single PDF file.

1.5 POST CONSTRUCTION SUBMITTALS

A. Record Drawings:

1. Record accurately on one set of drawings all changes in the work constituting departures from the original approved Shop Drawings and the actual final installed locations of all required components as shown below.
2. Record Drawings shall be prepared to the satisfaction of the Architect. Prior to final inspection of work, submit Record Drawings to the Architect.
3. Show locations and depths of the following items:

    a. Point of connection (including water POC, basket strainer, pressure regulator, master control valve, flow sensors, etc.)
    b. Routing of sprinkler pressure main lines (dimensions shown at a maximum of 100 feet along routing.)
    c. Isolation valves.
    d. Mainline air release valves.
    e. Automatic remote-control valves (indicate station number and size.)
    f. Quick coupling valves.
    g. Routing of control wires where separate from irrigation mainline.
    h. Irrigation controllers
    i. Related equipment (as directed)

B. Controller Charts:

1. Provide one controller chart for each automatic controller. Chart shall show

the area covered by the controller. The areas covered by the individual control valves shall be indicated using colored highlighter pens. A minimum of six individual colors shall be used for the controller chart unless less than six control valves are indicated.

2. When completed and approved, the chart shall be hermetically sealed between two pieces of plastic, each piece being a minimum 20 mils in thickness. The contractor is to provide a minimum of three (3) copies to the owner.

1.6 FIELD QUALITY CONTROL

A. Provide at least one English speaking person who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of materials being installed and the manufacturer's recommended methods of installation and who shall direct all work performed under this section.

B. Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturer of articles used in this contract furnish directions covering points not shown in the Specifications.

C. All local, municipal, and state laws, rules and regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these specifications, and their provisions shall be carried out. Anything contained in these Specifications shall not be construed to conflict with any of the above rules and regulations of the same. However, when these Specifications call for or describe materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by the above rules and regulations, the provisions of these Specifications shall take precedence.

D. Materials supplied for this project shall be new and free from any defects. Defective materials shall be replaced immediately at no additional cost.

E. Secure the required licenses and permits including payments of charges and fees, give required notices to public authorities, verify permits secured or arrangements made by others affecting the work of this section.

F. Acquire certificate of compliance from local authority indicating approval of backflow preventer installation.

1.7 FIELD MEASUREMENTS

A. Verify that field conditions are as shown in the drawings. Revise design and record drawing as required.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

B. Exercise care in handling, loading, unloading, and storing plastic pipe and fittings under cover until ready to install. Transport plastic pipe only on a vehicle with a bed long enough to allow the pipe to lay flat to avoid undue bending and

concentrated external load.

C. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

D. Use all means necessary to protect irrigation system materials before, during, and after installation and to protect the installation work and materials of all other trades. In the event of damage, immediately make all repairs and replacements necessary to the acceptance of the Landscape Architect and at no additional cost.

1.9 PROJECT CONDITIONS

A. Verify and determine the locations, size and detail of points of connection provided as the source of water and electrical supply to the irrigation system.

B. Irrigation design shall be based on the available water pressure. Verify the dynamic water required is available on the project prior to the start of construction. Should a lack of pressure exist to achieve the flow necessary to operate the system, notify the Landscape Architect prior to beginning construction.

C. Prior to cutting into the soil, locate all cables, conduits, sewer septic tanks, and other utilities that are commonly encountered underground, and take proper precautions not to damage or disturb such improvements. If a conflict exists between such obstacles and the proposed work, promptly notify the Landscape Architect who will arrange for relocations. Proceed in the same manner if a rock layer or any other such conditions are encountered. Call in utility locates prior to all trenching or excavation.

D. Protect all existing utilities and features to remain on and adjacent to the project site during construction. Repair, at Contractor’s own cost; all damage resulting from Contractor’s operations or negligence.

E. Coordinate installation of required sleeving per approved Shop Drawings

F. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied, unless permitted under the following conditions and then only after arranging to provide temporary water service according to the requirements indicated:

1. Notify Water Utility provider prior to Interruption.
2. Notify Architect no fewer than two working days (48 hours) in advance of proposed interruption of water service.
3. Do not proceed with interruption of water service without the Architect’s written permission.

1.10 GUARANTEE

A. The entire irrigation system, including all work done under this contract, shall be unconditionally guaranteed against all defects and fault of material and workmanship, including settling of backfilled areas below grade, for a period of one (1) year following the approved final acceptance.

B. Should any problem with the irrigation system be discovered within the guarantee period, it shall be corrected by the Contractor at no additional expense to the Owner within ten (10) calendar days of receipt of written notice from the Landscape Architect. When the nature of the repairs as determined by the Landscape Architect constitutes an emergency (i.e. broken mainline) the Landscape Architect may proceed to make repairs at the Contractor's expense. Damages to existing improvement resulting either from faulty materials or workmanship shall be repaired to the satisfaction of the Landscape Architect by the Contractor, all at no additional cost.

C. Manufacturer's warranties shall not relieve the Contractor of his liability under the guarantee. Such warranties shall only supplement the guarantee.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Rain Bird Corporation, Turf Division: For all irrigation system equipment and accessories.

B. NDS: For valve boxes.

C. Wilkins/Zurn: For backflow preventers

2.2 MATERIALS

A. Pipe:

1. PVC in accordance with ASTM D 1785: PVC Schedule 40 pipe for all sleeving, main lines, lateral lines, and fittings throughout system. Solvent-weld sockets.
2. Rigid copper pipe required from tap at public main through backflow preventer.

B. Fittings: Type and style of connection to match pipe.

C. Solvent Cement: ANSI/ASTM D 2564 for PVC pipe and fittings.

D. Tracer Wire: 14 AWG solid copper wire with insulating cover, to be tagged as “Tracer wire” with metal tags. Color of insulating cover must be different from other wiring.

E. Turf Outlets:

1. Spray Outlets: Pop-up spray bodies, 6 inch minimum to 12 inch riser heights as needed for adequate performance, with installed check valves and pressure regulating devices.
2. Stream Rotor Outlets: Pop-up stream rotor bodies, 6 inch and/or 12 inch riser heights as needed for adequate performance, with installed check valves and internal pressure regulating devices. Rotors without internal pressure regulation may be used if combined with a pressure regulating PVC pipe swing joint.

F. Drip System Outlets:

1. Drip Line: Pressure compensating surface type installation drip line with flexible tubing, 12 inch emitter spacing, and internal emitter check valves. Anchor line with galvanized wire anchors at 24”-30” spacing. Lines and connector fittings must be capable of operating at 50 PSI without supplementary clamps.
2. Drip Emitters: Pressure Compensating drip emitters for additional water to tree placements within drip zones; one drip emitter for each ornamental size tree and two drip emitters for each medium or large size tree. Provide diffuser caps for each emitter.

2.3 BACKFLOW PREVENTERS

A. Control Valves: Electric solenoid operating valves with glass filled nylon body construction. Size valves for minimum pressure loss for designed flow rate. Provide and install pressure regulating devices for each valve placement.

B. Backflow Preventer: Wilkins/Zurn: 975XL or 975XLSEU backflow preventer sized for maximum flow in system with a maximum pressure loss limited to 10% of available residual pressure.

C. Backflow Preventer Housing: DekoRRa model 301/302, Class II, turf brown granite color, anchored to 4” minimum concrete base per manufacturer’s details and specifications. Provide minimum size to cover with insulation bag.

2.4 CONTROLS

A. Controller: Automatic controller for electric valve operation sized for required number of stations, with grounding per manufacturer specifications and hardwired connections to power source.

B. Controller Housing:

1. Indoor Installations: Wall mount plastic housing with lockable access door. Indoor installations must be able to accommodate wiring or wireless system remote operation of rain and heat sensing device. Coordinate with electrician for power source
2. Outdoor Installations:

    a. Wall Mount: Stainless steel housing with lockable access door.
    b. Ground Mount: Stainless steel housing and pedestal with lockable access door.

C. Accessories: Include required fittings, galvanized metal electrical conduit, and accessories for installation.

D. Control Wiring: Gauge of wire to be sized by contractor for adequate operation of valves. Use waterproof connectors for all connections. Use different color wire jackets for valve power wires and white jacket for common wire.

E. System Grounding: Provide grounding at controller and throughout control wiring and valve layout to meet manufacturer’s standards with grounding devices as recommended by manufacturer.

F. Rain and Heat Sensor Device: Wireless automatic, adjustable, shutoff device to

disable/delay operations during or after recent rainfall and adjust watering cycle times for local heat and rainfall conditions. Provide and install connection equipment necessary for operation at controller.

2.5 OTHER EQUIPMENT

A. Swing Joints: Provide PVC pipe swing joints for all full circle rotor outlet placements.

B. Pressure Regulating Swing Joints: Provide pressure regulating PVC pipe swing joints for all rotor outlet placements without internal pressure regulation.

C. Valve Boxes and Covers: Valve boxes and covers required for all control valves, drip filters, drain valves, surge protector devices, wiring changes of direction, and wiring junctions.

D. Drip Filters: Replaceable and/or cleanable sized to match zone flows, installed with valve in valve box.

E. Drain Valves: Manual, PVC valves on tees for low points in system.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Verify location of existing utilities. Repair utilities damaged as a result of this work at no increase in Contract Sum.

C. Verify that required utilities are available in proper location and ready for use.

D. Verify available water pressure at meter or backflow preventer locations.

E. Verify sleeve locations.

F. Beginning of installation means installer accepts existing conditions.

3.2 PREPARATION

A. Layout and stake locations of system components.

B. Review layout requirements with other affected work. Coordinate locations of sleeves under paving to accommodate system. Notify Architect/Engineer for approval of field changes to system design.

C. Coordinate location of controller, rain and heat sensor device, and connections to power source with Owner, General Contractor, and Electrical Contractor.

3.3 TRENCHING

A. Minimum Trench Depth: Trench depth must provide a minimum of 18 inches of cover over all main lines and wiring and 12 inches of cover over all lateral lines.

B. Trench to accommodate grade changes and slope to manual drain valves at low points in system.

C. Maintain trenches free of rocks, obstructions, or other debris that may damage pipe or wiring.

D. Repair or replace existing improvements damaged by work performed under this contract with equivalent materials or products.

3.4 INSTALLATION

A. Install irrigation sleeving under all pavement crossings and buried at a minimum depth of 18 inches below finish grade. All sleeving trenches must match finish grade and be compacted to minimum subgrade requirements for paving.

B. Install pipe, backflow preventer, valves, valve boxes, wiring, grounding, drains, controls, and outlets in accordance with all applicable plumbing codes, manufacturer's details, instructions, and minimum standards.

C. Trenches for irrigation main and lateral lines must match finish grade and be compacted to the degree that no settlement will occur.

D. Install cast concrete thrust blocking at all piping bends for 3 inch or larger pipe sizes.

E. Install zone valves with pressure regulating devices in valve boxes per manufacturer specifications and details. Provide metal tag with zone number for each valve.

F. After piping is installed but before sprinkler heads are installed and trenches backfilled, open valves and flush system with full head of water.

G. Install spray and rotor outlets with fittings, flex pipe, swing joints, etc. Use threaded connections to lateral lines. Install in accordance with manufacturer's details, instructions and minimum standards.

H. Install drip lines, emitters, filters, fittings, etc. in accordance with manufacturer's details, instructions and minimum standards. Anchor line with galvanized wire anchors at 3 feet on center, minimum spacing.

I. Install manual drain valves at system piping low points and pipe connections from valves to site drainage system, or, provide 12" diameter by 24" deep, gravel filled drain sumps where piped connections are not feasible.

J. Connect to water and electrical services.

K. Set outlets and box covers at finish grade elevations.

L. Install control wiring in trenches along with main lines to valves and provide 30-inch expansion coil at each valve and change of direction. Also provide 30-inch expansion coils at 100-foot intervals between valves.

M. Tracer Wire: Install tracer wire from gate valve at backflow preventer along all main lines to each zone valve. Terminate at valve boxes with 24” wire coil and

metal tags labeled as “Tracer Wire.”

N. Install automatic controller. Provide hardwired connection to power source, enclose wiring to system and power source in rigid metal conduit where exposed. Paint exposed conduit to match building exterior.

O. Install rain and heat sensor device and wireless connection device to controller. Verify proper operation of device.

P. Program remote irrigation controller and install connection equipment necessary for operation at controller. Verify proper operation of remote.

Q. Repair or replace any other work or improvements damaged as a result of work related to system installation at no increase to the Contract Sum.

3.5 FIELD QUALITY CONTROL

A. Prior to backfilling and installation of outlets, cap or plug pipes and test system for leakage. Maintain maximum available pressure for one hour. Piping is acceptable if no leakage or loss of pressure occurs during test period.

3.6 ADJUSTING

A. Adjust control system to achieve time cycles required for adequate watering at time of installation.

B. Adjust heads and/or nozzles to achieve proper coverage and performance. Make nozzle or head changes as necessary for proper coverage.

C. Adjust zone valves for proper operating pressures at valve zones.

3.7 EXTRA MATERIALS

A. Furnish to Owner the following extra components:

1. Two sprinkler heads of each type and size.
2. Two nozzle inserts for each type and size.
3. Two drip emitters of each type and size
4. Two drip line basket filters of each type and size.
5. Two keys each for valve boxes and controller (if locked boxes are used).
6. Two of any required special tools for adjustment or replacement of each type of outlet, nozzle, valve, and other system equipment.

3.8 CLOSEOUT

A. Provide system demonstration to Owner and Architect/Engineer for review and final acceptance of work. Coordinate demonstration of procedures for winterizing (draining system lines, backflow preventer, etc.) and spring start-up with Owner. Review system operation and components during service visit.

B. Instruct Owner or representative in operation and maintenance of system, including adjusting of sprinkler heads. Use operation and maintenance material as basis for demonstration.

C. Deliver record drawing of system, required operation and maintenance information, extra materials and backflow preventer certificate to Owner at the instruction meeting.

D. Provide system demonstration to Owner and Architect/Engineer for review and final acceptance of work. Coordinate demonstration of procedures for winterizing (draining system lines, backflow preventer, etc.) and spring start-up with Owner. Review system operation and components during service visit.

E. Instruct Owner or representative in operation and maintenance of system, including adjusting of sprinkler heads. Use operation and maintenance material as basis for demonstration.

F. Deliver record drawing of system, required operation and maintenance information, extra materials and backflow preventer certificate to Owner at the instruction meeting.

3.9 WARRANTY

A. Provide one-year materials and workmanship warranty on all system components and installation beginning on date of acceptance of the work.

B. Replace failed components immediately upon notification by Owner or Architect/Engineer.

END OF SECTION

SECTION 329113

SOIL PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, as required to make a complete and thorough preparation of the planting soil, including soil amendment products, imported topsoil, as required, to make up deficiencies in quantity of soil available on site, as shown in the Contract Drawings, and as specified herein this Section.

B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:

1. Agronomic Soil Fertility Testing and Soil Percolation Testing.
2. Topsoil.
3. Pre-Plant Weed Control.
4. Soil Conditioners, Amendments and Fertilizers (Organic & Chemical).

C. Related Requirements:

1. Section 31 2000: Earthwork
2. Section 329300 "Plants" for placing planting soil for plantings.
3. Section 32 8400: Irrigation Systems
4. Section 329200 "Turf and Grasses" for placing planting soil for turf and grasses.

1.2 DEFINITIONS AND APPLICABLE STANDARDS

A. References:

1. USDA – United States Department of Agriculture.
2. ASTM – American Society for Testing & Materials.

B. Definitions:

1. Topsoil - Shall be friable soil, providing sufficient structure in order to give good tilth and aeration to the soil. Topsoil shall be free of roots, clods, stones larger than one-inch (1”) in the greatest dimension, pockets of coarse sand, noxious weeds, sticks, lumber, brush and other litter. It shall not be infested with nematodes or other undesirable disease-causing organisms such as insects and plant pathogens.
2. Gradation Limits - Soil shall be a sandy loam, loam, clay loam or clay. The definition of soil texture shall be per the USDA classification scheme. Gravel over ¼-inch in diameter shall be less than 20% by weight.
3. Permeability Rate - Hydraulic conductivity rate shall be not less than one-inch (1”) per hour, nor more than twenty-inches (20”) per hour, when tested in accordance with the USDA Handbook Number 60, Method 34b, or other approved Methods.
4. Fertility - The range of the essential elemental concentration in soil shall

be as follows: (cont. next page) Ammonium Bicarbonate/DTPA Extraction (PPM) Element Concentration of elements for Soil Selection, measured as mg/kilogram dry weight basis Concentration of Elements for Final Acceptance (amended and conditioned soil) measured as mg/kilogram dry weight basis Phosphorus 2 - 40 10 – 40 Potassium 40 - 220 100 – 220 Iron 2 - 35 24 – 35 Manganese 0.3 - 6 0.6 – 6 Zinc 0.6 - 8 1 – 8 Copper 0.1 - 5 0.3 – 5 Boron 0.2 - 1 0.2 – 1 Magnesium 50 - 150 50 – 150 Sodium 0 - 100 0 – 100 Sulfur 25 - 500 25 – 500 Molybdenum 0.1 - 2 0.1 - 2

5. Acidity - The soil pH range measured in the saturation extract (Method 21a, USDA Handbook Number 60) shall be 6.0 – 7.9.
6. Salinity - The salinity range measured in the saturation extract (Method 3a, USDA Hand Number 60) shall be 0.5 – 2.0 dS/m. If calcium and if sulfate ions both exceed 20 milli-equivalents per liter in the saturation extract, the maximum salinity shall be 4.0 dS/m.
7. Chloride - The maximum concentration of soluble chloride in the saturation extract (Medoth3a, USDA Handbook Number 60) shall be 150 mg/1 (parts per million).
8. Boron - The maximum concentration of soluble boron in the saturation extract (Method 3a, USDA Handbook Number 60) shall be 1 mg/1 (parts per million).
9. Sodium Adsorption Ratio (SAR) - The maximum SAR shall be 3 measured per Method 20b, USDA Handbook Number 60.
10. Aluminum – Available aluminum measured with the Ammonium Bicarbonate/DTPA Extraction shall be less than 3.0 parts per million.
11. Soil Organic Matter Content - Sufficient soil organic matter shall be present to impart good physical soil properties but not be excessive to cause toxicity or cause excessive reduction in the volume of soil due to decomposition of organic matter. The desirable range is 3% to 5%. The carbon/nitrogen ratio should be about 10. A high carbon/nitrogen ratio can indicate the presence of hydrocarbons or non-humified organic matter.
12. Calcium Carbonate Content - Free calcium carbonate (limestone) shall not be present in acid-loving plants.
13. Heavy Metals - The maximum permissible elemental concentration in the soil shall not exceed the following concentrations: (cont. on next page) Ammonium Bicarbonate/ DTPA Extraction (PPM) Element (mg/kilogram) dry weight basis Arsenic 1.0 Cadmium 1.0 Chromium 10.0 Cobalt 2.0 Lead 30.0 Mercury 1.0 Nickel 5.0 Selenium 3.0 Silver 0.5 Vanadium 3.0

    a. If the soil pH is between 6 and 7, the maximum permissible elemental concentration shall be reduced 50% to the above values. If the soil pH is less than 6.0, the maximum permissible elemental concentration shall be reduced 75% of the above values. No more than three (3) metals shall be present at 50% or more of the above values.

14. Phytotoxic constituent, herbicides, hydrocarbons, etc. – Germination and growth of plants shall not be restricted more than 10% compared to the reference soil. Total petroleum hydrocarbons shall not exceed 50 mg/kg dry soil measured per the modified EPA Method No. 8015. Total aromatic volatile organic hydrocarbons (benzene, toluene, xylene and ethylbenzene) shall not exceed 0.5 mg/kg dry soil measured per EPA Method No. 8020.
15. Sub Grade - Soil level resulting from the rough grading work under another Section. Cultivation of sub grade areas prior to placement of Topsoil is included in this Section.
16. Stockpiled Topsoil - Soil stockpiled for spreading over prepared sub-grade.

17. Stockpiled Native Topsoil - Topsoil stripped from the site prior to rough grading Work (under another Section), to be spread and amended as Work under this Section.
18. Imported Topsoil - Off-site Topsoil, imported and stockpiled under this Section, to be spread and amended as Work under this Section.

C. Measurements:

1. PPM: Measurement, in parts per million.

1.3 QUALITY ASSURANCE

A. Installer Qualifications for requirements indicated herein this Section:

1. Licensed Landscape Contractor, in the State of Arkansas.

a. Engage an experienced, licensed Contractor who has completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful landscape establishment.
b. Installer's Field Supervision: Contractor shall maintain an experienced, full-time landscape supervisor/superintendent at the Project Site during times that landscaping operations identified herein the Contract are in progress.

B. Manufacturer’s Directions: Follow Manufacturer’s directions and drawings in cases where the Manufacturers of articles used in this Section furnish directions covering points not shown in the Contract Drawings or Contract Specifications.

C. Permits, Fees, Bonds, Testing, and Inspections: Contractor shall arrange and pay for permits, fees, bonds, testing, and inspections necessary to perform and complete his portion of the Work.

D. Approved Testing Laboratory and Procedures for Agronomic Soil Fertility Analyses:

1. Agronomic Soil Fertility Analyses shall be conducted by a reputable, certified, agronomic soils laboratory. Laboratory shall be a member of the Council on Soil Testing and Plant Analysis. The same laboratory shall be used throughout the duration of the Contract:
2. Contractor shall verify and confirm the selected Testing Laboratory and specific location(s) of soil sample(s) with the Landscape Architect prior to commencing soil sampling operations.
3. For each Soil type, submit the physical Soil Samples directly to the selected Laboratory for analysis, per the procedures outlined per Part III herein this Section.

a. In addition to the physical Soil Samples, Contractor shall also provide the Laboratory with a copy of the Soil Amendment and Fertilizer products indicated herein this Section.

4. Along with the testing data results, the Agronomic Soil Fertility Analysis shall also include written recommendations authored by the Laboratory conducting the Analyses for amending, treating, and/or correcting the sampled soils. Laboratory shall utilize the organic-based Soil Amendments

and Fertilizers described herein this Section to the greatest extent possible to produce satisfactory planting soil(s) suitable for sustaining healthy viable plant growth.

a. The Analyses shall also include Maintenance and Post-Maintenance fertilization programs for planted areas within the Contract.

5. Agronomic Soil Fertility Analyses shall be performed on each Soil Type samples, and include testing results for the following pH Electro-conductivity (salinity) measurement – saturated extract. Measurement of sodicity (Sodium Absorption Ratio) Estimate of soil texture and soil organic matter Presence of lime Nutrients/Toxic Elements measurement of DPTA extract Saturation extracts for nitrate, sulfate, sodium, calcium, magnesium, potassium, soluble phosphate, and boron Parasitic nematodes Herbicide contamination (For Lightweight Soil Mixes) Test for physical and chemical composition, and saturated weight per cu.ft.
6. Planting operations shall not commence until the results of the Agronomic Soil Fertility Analysis and Recommendations are reviewed accordingly by the Landscape Architect.
7. The quantity or type of amendments may be modified by the Landscape Architect within fourteen (14) days of receipt of the results. The Agronomic Soil Fertility Analysis and Recommendations shall take precedence over the amendment and fertilizer application rates specified herein or on the Contract Documents.
8. The Agronomic Soil Fertility Report/Recommendation shall take precedence over the amendment and fertilizer application rates specified herein or on the Contract Documents.

1.4 SUBMITTALS

A. General:

1. Collect information into a single Submittal for each element of construction and type of product or equipment identified under this Section for review.
2. Submittal Format: As applicable, furnish Submittal as a single electronic digital PDF (Portable Document Format) file.

B. Digital Submittal Information:

1. Product/Material Data: Submit available product/material literature supplied by manufacturer’s, indicating that their products comply with specified requirements. Provide manufacturing source (name, address, and telephone number), and distributor source (name, address, and telephone number) for each type of product/material.

a. Planting Soil (Imported/Amended Topsoil).
b. Soil Amendments (for each type used, for Sand, Perlite, Peat Humus, Gypsum, Soil Sulfur, Iron, etc).
c. Bulk Composted Organic Soil Amendment Material.
d. Granular Soil Conditioning Material.
e. Mycorrhizal Inoculum.
f. Fertilizers (for each type used).

2. Agronomic Soil Fertility Analysis and Recommendations: Submit a minimum of fourteen (14) days prior to amending of the soil and ordering

soil amendments. The locations of where each of the soil test samples were derived from the Project Site shall be keyed to the site plan and shall be included with the results.

3. Qualification Data: Submit names for firms and persons specified in the “Quality Assurance and Control” Article to demonstrate their capabilities and experience on similar installations.

C. Material Samples: Submit four (4) sets of physical Material Samples for review of kind, color, pattern, size, and texture for a check of these characteristics with other elements, and for a comparison of these characteristics between Submittal and actual component as delivered and installed. Include the full range of exposed color and texture expected in the completed work. Provide Material Samples bound and individually wrapped in re-sealable labeled 1-gallon plastic bags (as applicable):

1. Provide Material Sample sets for each item submitted under Product/Material Data.

D. Submittals under this Article will be rejected without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if the required information is missing or not presented in the format as requested.

E. No Work shall proceed under this Section until Submittal requirements indicated herein have been reviewed accordingly by the Landscape Architect.

1.5 DELIVERY, STORAGE, AND HANDLING

A. General: Deliver and install materials so as to not delay Work and install only after preparations for installation have been completed.

B. Packaged Materials Deliver packaged materials in original, unopened packages or containers, with manufacturer's labels intact and legible, showing weight, analysis, and name of manufacturer. Store and secure properly to prevent theft or damage.

1. Store packaged materials off ground and under cover, away from damp surfaces and inclement weather.
2. Protect during storage and construction against soilage or contamination from earth and other materials.

C. Bulk Materials:

1. Deliver and store bulk materials so as not to impede Work of others.
2. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
3. Protect during storage and construction against soilage or contamination from earth and other materials. Provide adequate separation between bulk materials so as not to cross-contaminate bulk materials.
4. Store under cover, away from inclement weather.
5. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
6. Do not move or handle materials when they are wet or frozen.
7. Accompany each delivery of bulk fertilizers and soil amendments with

appropriate certificates. Furnish original certificates to Landscape Architect upon request.

1.6 COORDINATION, SCHEDULING, AND OBSERVATIONS

A. Notify the Contractors performing Work related to installation of Work under this Section in ample time to allow sufficient time for them to perform their portion of Work and that progress of Work is not delayed. Verify conditions at the Project Site for Work that affects installation under this Section. Coordinate items of other trades to be furnished and set in place.

B. Utilities: Determine location of above grade and underground utilities and perform Work in a manner which will avoid damage to utilities. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.

C. Excavation: When conditions detrimental to adequate Soil Preparation operations are encountered, such as rubble fill, adverse drainage conditions, or obstructions, cease operations and notify Landscape Architect for further direction.

D. Installation: Perform Soil Preparation operations only when weather and soil conditions are suitable in accordance with locally accepted practices.

E. Construction Site Observations: Periodic site observations shall be made by the Landscape Architect during the installation of Work under this Section for compliance with requirements for type, size, and quality. Landscape Architect retains right to observe Work for defects and to reject unsatisfactory or defective material at any time during progress of Work. Contractor shall remove rejected materials immediately from Project site, all associated cost are to be paid by the contractor.

1.7 SITE CONDITIONS

A. Project Site shall be free of weeds, native grasses, evasive grasses, (Bermuda Grass, Johnson Grass, Nut Grass, etc.) prior to Topsoil distribution or soil amendment placement.

B. Excessive rock, dead or declining vegetation, trash, debris, or other items that has accumulated throughout the duration of the Project shall be removed from the Project Site by the Contractor, and as directed by the Landscape Architect.

C. Grading and soil preparation Work shall be performed only during the period when beneficial and optimum horticultural results may be obtained. If the moisture content of the soil should reach such a level that working it would destroy soil structure or cause compaction, spreading and grading operations shall be suspended until, in the opinion of the Landscape Architect, the moisture content is increased or reduced to acceptable levels and the desired results are likely to be obtained.

1. Soil moisture level prior to planting shall be no less than 75% of field capacity. The determination of adequate soil moisture for planting shall be in the sole judgment of the Landscape Architect.
2. If the soil moisture level is found to be insufficient for planting, planting pits shall be filled with water and allowed to drain before commencing planting

operations.

D. Planting areas which become compacted in excess of 85% relative compaction due to construction activities shall be tilled and thoroughly cross-ripped to a minimum depth of twelve-inches (12”) to alleviate the condition, taking care to avoid all existing subsurface utilities, drainage, etc.

PART 2 - PRODUCTS

2.1 PLANTING SOIL (TOPSOIL)

A. Topsoil: Meet ASTM D5268, pH range of 5.5 to 7, 4 percent organic material minimum.

1. Topsoil Source: Reuse native surface soil stockpiled on the site. Verify suitability of native surface soil stockpiled on site to produce Topsoil meeting requirements; amend, as necessary. Supplement native surface soil stockpiled on site with imported Topsoil when quantities are insufficient.

   a. Composition: Fertile, friable, well-drained soil, of uniform quality, free of stones over one-inch (1”) diameter or larger in any dimension sticks, oils, chemicals, plaster, concrete, roots, plants, sod, and other deleterious or extraneous materials harmful to plant growth.
   b. Obtain an Agronomic Soil Fertility Report/Recommendation of the stockpiled Topsoil from the approved Testing Laboratory indicated herein this Section.
   c. Test Results: Request Testing Agency to send one (1) copy of test results direct to the Landscape Architect and one (1) copy to the Owner. Amend as required.

2. Topsoil Source Provide Imported Topsoil obtained from off-site sources, from naturally well-drained sites do not obtain from bogs or marshes.

   a. Quantity: Provide Imported Topsoil as soon as an insufficient quantity of native stockpiled surface soil is verified. Quantity of Imported Topsoil to complete the Work shall be calculated by Contractor
   b. Stockpiling: Stockpile on site as directed by Owner.
   c. Composition: To match in quality, accepted native stockpiled Topsoil.
   d. Analysis: Obtain an Agronomic Soil Fertility Report/Recommendation of the Imported Topsoil from the approved Testing Laboratory indicated herein this Section.
   e. Review: Landscape Architect reserves the right to take samples of the Imported Topsoil delivered to the site for conformance to the Contract Specifications.
   f. Rejected Imported Topsoil: Immediately remove rejected Imported Topsoil off site, at Contractor's expense.

2.2 SOIL MIXES/BLENDS (BACKFILL/PLANTING MIX)

A. Soil Conditioner Blend, for amending on-site native soil planting surfaces, stockpiled, plant back fill or imported topsoil: Furnish a thoroughly blended composition of Bulk Composted Organic Soil Amendment Material and Granular

Soil Conditioning Material & Fertilizer. Any substitution for the “Soil Conditioner Blend” listed herein must be requested by the Contractor and approved, in writing, by the Landscape Architect at least thirty (30) days prior to installation.

1. Bulk Composted Organic Soil Amendment Material:

   a. Material Composition: Bulk Composted Organic Soil Amendment Material shall be thoroughly cured for a minimum of 100 days, and shall be free from any trash (glass, metal, plastic, etc.) deleterious materials, bio-solids, and/or toxic chemicals. The Material shall be non-hazardous, and conform to US Environmental Protection Agency 40 CFR503 criteria for “Class A” products. It shall also exceed standards and specifications for unrestricted application as a landscaping and agricultural soil amendment.
   b. Humus material shall have an acid-soluble ash content of no less than 6% and no more than 20%. The organic matter content shall be at least 50% on a dry weight basis.
   c. Types of acceptable products are composts, manures, mushroom composts, straw, alfalfa, peat mosses etc. low in salts, low in heavy metals, free from weed seeds, free of pathogens and other deleterious materials.
   d. Composted wood products are conditionally acceptable . Wood based products are not acceptable which are based on red wood or cedar.
   e. Sludge-based materials are not acceptable.

      1) Gradation/Screen Analysis: A minimum of 90% of the material by weight shall pass a ½” screen. Material passing the screen shall meet the following criteria: Percent Passing Sieve Designation 80 – 100% 6.35 mm (1/4”) 50 – 80% 2.38 mm (No.8) 0 – 40% 500 micron (No.35)
      2) Maturity: Physical characteristics suggestive of maturity include shall include:

         a) Color: Dark brown to black.
         b) Odor: Aerobic, without malodorous presence of decomposition products.
         c) Particle characterization: Identifiable wood pieces are acceptable, but the balance of Material should be soil-like without recognizable grass or leaves.
         d) Analytical Properties: Contractor shall submit proof of the Bulk Composted Organic Soil Amendment Material by providing a sample as identified herein this Section, and a lab analysis that has been performed within 30 days of the installation of the planting. Soil mix shall have (at a minimum) the following properties: Material Minimum Targeted Property/Range Total Nitrogen (N%) .50-1.0% Phosphorus (as P2O5) 2.0% Potassium (as K2O) 0.2% pH (units) 6.0 to 7.5, as determined in saturated paste. Organic Content Minimum 50% based on dry weight and determined by ash method. Minimum 205 lbs. organic matter per cubic yard of compost. ECe (millimho/cm) 5.0; based on pre-leaching with equal volume of water. Carbon-to-Nitrogen Ratio 25-to-1, nitrogen stabilized. Bulk Density 1,000 to 1,100 pounds/cubic yard. Sodium

Absorption Ratio (SAR) Under 20.0 Total Iron 1.5% - 3.0% Moisture Content 35%-60% Acid-soluable Ash content No less than 6% and no greater than 20%. Salt Content 10millimho/cm @ 25d C. on a saturated paste extract. Boron Content 1.0 parts per million on a saturated paste extract. Silicon-Content (acid-insoluable ash) 50% Calcium Carbonate No presence on alkaline soils. Maximum Total Permissible Pollutant Concentrations Parts per million (mg/kg dry-weight basis) • Arsenic: 1.0 • Cadmium: 1.0 • Chromium: 10.0 • Cobalt: 2.0 • Copper: 1.0 • Lead: 30.0 • Mercury: 1.0 • Molybdenum: 2.0 • Nickel: 5.0 • Selenium: 1.0 • Silver: 0.5 • Vanadium: 3.0 • Zinc: 2.0

e) Application Rate: As indicated herein this Section under “Planting Soil Amendments Schedule”.

f) Commercial-Grade Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

3) Provide submittal and sample to be approved by the Landscape Architect

2. Granular Soil Conditioning Material & Fertilizer:

a. Material Composition and Analytical Properties: Granular Soil Conditioning Material & Fertilizer shall be a singular manufacturer-blended combination of soil conditioning material and fertilizer. It shall be granular in form, long-lasting, free flowing, and suitable for application with approved equipment. It shall not contain any sewage sludge or manure-based products, and shall contain the following guaranteed minimum available analysis range: Element/Material Targeted Property Range Nitrogen (N) 5.0% to 6.0% Phosphoric Acid (as P2O5) 2.0% to 3.0% Potash (as K2O) 1.0% to 4.0% Humic Acids 15.0 % to 20.0% Calcium 7.0% Sulfur 0.0% to 5.0%

b. Commercial-Grade Products, Manufacturers and Associated Rates of Application: Subject to compliance with requirements.

1) Provide submittal and sample to be approved by the Landscape Architect.

B. Washed Plaster Sand: Clean, washed, natural or manufactured sand, sharp, fine-textured, free of toxic materials. Sieve tested in accordance with ASTM C136, with 100% passing through a #4 screen, 0% passing through a #200 screen.

1. Chemical Properties: (by DPTA Saturation Extract Method):

a. Soluble Salts/Salinity: Maximum conductivity of 3.0 millimhos/cm at 25 degrees C.
b. Boron: Maximum concentration of 1.0 PPM.
c. Sodium Absorption Ratio (SAR): Maximum 6.0.
d. pH: 7.0.

C. Perlite: Horticultural Perlite, soil amendment grade, 6.5 to 7.5 pH.

1. Unacceptable Materials: Polystyrene beads shall not be used as a substitution for horticultural Perlite.

D. Vermiculite: Horticultural Vermiculite, gold-brown in color.

1. Size: 2-4mm, 5 mesh to 10 mesh sieve size.
2. Density: 4.5 to 5.5 lb./cu ft.
3. Grade: #2, Medium Grade.

2.3 INORGANIC SOIL AMENDMENTS

A. Peat Humus:

1. Type: Canadian Sphagnum Peat, as derived from the genus Sphagnum, medium-divided, coarse fibrous texture, brown in color.
2. Measurement: Measure peat in air dry condition, containing not more than 35% moisture by weight on an "as-received" basis.
3. Physical Properties: Percent Passing Sieve Designation 95 – 100% 9.51 mm (3/8”) 0 – 40% 500 micron (No.35)
4. Organic Content (dry weight basis): Minimum 95%.
5. Fiber Content: Greater than 66%.
6. Water Holding Capacity: 20x to 30x its dry weight in water.
7. Range in Ash Content (%): 1.0 to 5.0.
8. Chemical Properties:

a. Nitrogen (dry weight basis): 0.6-3.0%.
b. Salinity/Soluble Salts: Saturation extract conductivity 0.0-3.0 millimhos/cm @ 25 degrees C.
c. pH range: 3.0 to 4.0.

9. Unacceptable Materials:

a. Coir Dust.
b. Sedge Peat.
c. Reed Peat.
d. Hypnum Peat.

B. Mycorrhizal Inoculum

1. Mycorrhizal Inoculum for Plant Material: Dual soil-conditioning biological inoculum system of endo-and ecto- Mycorrhizal, used to further aid the plants ability to efficiently uptake available soil nutrients and increase resistance to drought.

a. Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1) 7-gram Myco-Pak, Tri-C Enterprises LLC, Chino, CA, 800-927-3311.
2) 4 oz. Packet - Roots 1 Step, Roots, Inc., Independence, MO, 800-342-6173.
3) Or equal, as approved by the Landscape Architect.

b. Provide at the prescribed application rate, per the Manufacturer’s written recommendations.

2.4 CHEMICAL SOIL AMENDMENT COMPONENTS

A. General: Chemical Soil Amendment Components listed herein may or may not be used, depending on the results of the Agronomic Soil Fertility Report. Provide as required.

B. Gypsum: Commercially-processed and packaged agricultural-grade hydrated calcium sulfate product (CaSO4), 92.0% minimum, pH at 7.1.

1. Commercial-Grade Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Ben Franklin® No. 1 Agricultural Gypsum, U.S. Gypsum Company.
b. 100% Good Stuff Gypsum™, Art Wilson Company.
c. CAL-SUL® Pelletized Agricultural Gypsum, North Pacific Group.
d. Bumper Harvest Agricultural Gypsum, Domtar Gypsum.
e. Premium 97 Solution-Grade Gypsum, Diamond K, Inc.
f. Or equal, as approved by the Landscape Architect.

C. Soil Sulfur: Elemental Sulfur (90% min.) commercially manufactured, water degradable, palletized.

1. Commercial-Grade Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Disper-Sul, Martin Resources, Inc.
b. Soil Sulfur, Red Top.
c. Or equal, as approved by the Landscape Architect.

D. Iron: Non-staining, 40% Fe minimum, complete with micro-nutrients and 2% humic acids, as derived from iron oxide, manganese oxide, or zinc oxide.

1. Commercial-Grade Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the follo

a. Gro-Power Iron, Gro-Power, Chino, CA.
b. Iron 45 w/ Micronutrients, Tri-C Enterprises LLC, Chino, CA.
c. Or equal, as approved by the Landscape Architect.

E. Dolomite Lime: Agricultural-grade mineral soil conditioner containing 35% minimum magnesium carbonate, and 49% minimum calcium carbonate, 100% passing #65 sieve.

F. Potassium Sulfate (Sulfate of Potash K2O), (0-0-50 guaranteed analysis N-P2O5-K2O): Agricultural-grade, containing minimum 50% of water-soluble potash and 18% Sulfur (S).

G. Single Superphosphate P2O5 (0-15-0 guaranteed analysis N-P2O5-K2O): Commercial product, containing 15% available phosphoric acid and 14% Sulfur.

H. Triple Superphosphate P2O5, (0-45-0 guaranteed analysis N-P2O5-K2O): Commercial product, containing 45% available phosphate and 15% Calcium (Ca).

I. Ammonium Sulfate (NH4)2SO4, (21-0-0 guaranteed analysis N-P2O5-K2O):

Commercial product containing approximately 21% ammonia.

J. Ammonium Nitrate NH4NO3, (34-0-0 guaranteed analysis N-P2O5-K2O): Commercial product containing approximately 34% ammonia.

K. Calcium Nitrate CaNO3, (15.5-0-0 guaranteed analysis N-P2O5-K2O): Agricultural grade containing 15-1/2% nitrogen.

L. Potassium Nitrate KNO3, (13-0-45 guaranteed analysis N-P2O5-K2O): Commercial product containing approximately 13% nitrogen and 45% potassium.

M. Ureaformaldehyde (38-0-0 guaranteed analysis N-P2O5-K2O): Granular commercial product containing approximately 38% nitrogen.

N. Urea CO(NH2)2, (46-0-0 guaranteed analysis N-P2O5-K2O): Granular commercial product containing 46% nitrogen

O. I.B.D.U. (Iso Butyldiene Diurea): Commercial product containing 31% nitrogen.

2.5 FERTILIZERS

A. Composition: Nitrogen (N), phosphorous (P2O5), and potassium (K2O) content, plus other elements, as indicated.

B. Fertilizer Tablet:

1. General: Fertilizer Tablet shall be a 7-gram tablet, organic-based, tightly compressed chip-type commercial grade, 12-month slow-release planting tablets, and shall be composed of the following available percentages by weight of plant food: Element/Material Targeted Property Range Nitrogen (N) 12% Minimum Phosphoric Acid (as P2O5) 8% Minimum Potash (as K2O) 8% Minimum Humus 20% Minimum Humic Acids w/ micronutrients and soil enhancers 4% Minimum
2. Commercial-Grade Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Gro-Power 12-8-8 Planting Tablets, Gro-Power.

1) Application Rate: As indicated herein Part III this Section.

b. Or equal, as approved by the Landscape Architect.

2.6 ACCESSORIES

A. Drain Rock/Aggregate: Crushed Stone, conforming to ASTM C33, graded to ¾"-size, clean, hard, durable, free of materials toxic to plant growth, set in bottom of Planters, at depth indicated in Contract Drawings. Provide Geotextile Filter Fabric between Drain Rock/Aggregate and amended planting backfill soil.

B. Wetting Agent/Water Storing Polymer: Non-biodegradable, granular, polyacrylamide polymer soil amendment.

1. Commercial-Grade Products & Manufacturers: Subject to compliance with requirements, approved through submittal.

C. Landscape Mulch Material:

1. Organic Wood Mulch: Triple Hammered Hardwood Mulch
2. Decomposed Granite: 5/8” Canyon Gold from Blessing Gravel. Tishomingo, OK.
3. Landscape Mulch Material for Submersible Planting Pots: Native River Cobble, to be approved through submittal.

PART 3 - EXECUTION

3.1 ARGONOMIC SOIL FERTILITY REPORT/RECOMMENDATION

A. Once rough grading has been accomplished, and prior to commencing Soil Preparation operations, (amendments, fertilizers, etc.), soil samples shall be taken from representative areas and below grade depths of the Project Site. Locations and depths to gather the representative soil samples shall be accomplished by the Contractor under the direction of the Landscape Architect.

1. Provide a minimum of ten (10) Soil Samples from locations to be coordinated.

B. Guidelines for Selecting the Soil Samples:

1. Select representative areas to sample. The area needs to be uniform in color, texture, depth, and drainage with the same fertilizing program and type of use. Planting areas to receive lawns, flowerbeds, trees, cut areas, fill areas, etc. should be tested separately. An area containing multiple trees and shrubs can be grouped into one area if the planting is the same.
2. Depths and process of soil sampling:

a. Sample as deep as the soil will be amended, generally six-inches (6”) deep for groundcover/lawns, eighteen-inches (18”) deep for shrub areas, twenty-four-inches (24”) deep for small boxed trees, and three-feet (3’) to four-feet (4’) for large boxed trees.
b. Use a soil probe or soil auger to remove a core sample; otherwise, use a shovel to dig a hole to the desired depth. Sample the soil from the side of the excavated hole, scraping the side with a trowel. The tools used for digging shall be clean and not rusty. Avoid sampling when the soil is too wet.

3. In desired areas where multiple sub-samplings are taken from any one (1) area to create a combined sample, mix the sub-samples homogenously together in a clean plastic bucket prior to placing in the plastic bag.
4. Each Sample shall be sent directly to the laboratory in a separate, re-sealable, one (1)-gallon plastic bag. Provide a minimum of four (4) cups of soil within each respective sample to allow for adequate testing.

3.2 SOIL PERCOLATION TESTING

A. Type/Quantity: During operations of Agronomic Soil Fertility Testing and prior to installing Plant Material, Contractor shall perform Soil Percolation Tests, through the direction of the Landscape Architect, in selected representative areas of the Project Site, to verify acceptable natural drainage, soil structure, and soil composition. Contractor shall verify the locations of the Soil Percolation Tests with the Landscape Architect

1. Required Number of Soil Percolation Tests: ten (10)

B. Procedure: Each Soil Percolation Test shall be performed as follows:

1. Dig a hole: 2'-0" wide x 2'-0" long x 2'-0" deep.
2. Fill the hole with water to top and cover with plywood and barricade. Allow hole to drain and fill again to top.
3. Make daily observations, noting the depth of water each day.
4. Report findings, in writing, to the Landscape Architect. Include the length of time the water takes to drain completely from each hole, date of test, location, and other information, which may be useful in providing further recommendations.

C. Results: Based on the combined results of the Agronomic Soil Fertility Testing and the Soil Percolation Tests, Contractor may be required to install additional tree drainage sumps or other drainage methods at each planting pit for trees larger than 15-gallon container stock. Contractor shall include, as a line-item price within the Base Bid, the price per each additional tree drainage sump, should they be required (based on the testing).

3.3 SOIL MOISTURE CONTENT

A. General: Do not work soil when moisture content is so great that excessive compaction occurs, or when it is so dry that dust will form in air, or that clods will not break readily. Apply water, if necessary, to bring soil to an optimum moisture content for tilling and planting. Soil moisture level prior to planting shall be no less than 75% of field capacity. The determination of adequate soil moisture for planting shall be the judgment of the Landscape Architect. Range: Maintain within two-percent (2%) above or below optimum moisture content at times during Work.

3.4 CLEARING, CULITIVATION, & EXCAVATION

A. Clearing: Clear planting areas free of stones two-inches (2") in diameter and larger, weeds, debris, and other extraneous materials prior to soil preparation Work.

B. Pre-Plant Weed Control:

1. Clear and remove existing weeds by spraying and grubbing to at least one-inch (1") below the soil surface.
2. Dead weeds shall be cleared and removed prior to planting
3. Maintain a weed-free Project Site until final acceptance by the Owner, utilizing mechanical, chemical, or manual treatment.

C. Cultivation of Native Site, with Amendments/Fertilizers:

1. Verification: In planting areas where Native Topsoil blend will be applied, verify that sub-grades prior to installation of Topsoil have been established under rough grading. Do not spread Topsoil prior to acceptance of sub-grade Work.
2. Cultivation: Following Pre-Plant Weed Control operations, rip or cultivate verified planting areas of Native Site Soil at the indicated depth, prior to applying Imported Topsoil (if required) and Soil Amendments/Fertilizers.

a. Depth of Cultivation for existing soils: As specified in Drawings or minimum 8-inches (8”).
b. Depth of Excavation for imported soils: As specified in Drawings or minimum 8-inches (8”).

3. Following initial cultivation or excavation of existing Native Site Soil, evenly spread Imported Topsoil (if required) throughout all planting areas at the minimum indicated depth to meet finished landscape grades.

a. Depth of Imported Topsoil: As indicated on the Drawings.
b. Minimum of eight-inch (8”) at Landscape Beds or Mass Planting areas.
c. Minimum of six-inches (4”) at Sodded areas.
d. Minimum of six-inches (2”) at Permanent Seeded areas.

4. Once Imported Topsoil has been spread, uniformly broadcast all required Soil Amendments and Fertilizers as recommended through the results of the Agronomic Soil Fertility Report.
5. Thoroughly cultivate/blend all materials to provide a homogenous planting soil mixture at the indicated depth:

a. Depth of Cultivation: Minimum eight-inches (8”).

6. Lightly tamp/compact prepared Planting Soil to eliminate settlement, and complete finish grading operations.
7. Planting Soil Amendment Schedule: The Planting Soil Amendment Schedule shall be based on the combined results of the Agronomic Soil Fertility Tests and Percolation Tests and recommendations provided by the Testing Agency/Lab.

3.5 APPLICATION RATES

A. Fertilizer Tablets shall be spread equidistantly around the perimeter within the Amended Planting Backfill Mixture, up to within three-inches (3”) of the finished grade of the Mixture, and at the following rates: Size of Plant Material Total Quantity of 7-gram tablets One (1)-gallon Container stock. One (1) Tablet Five (5)-gallon Container stock. Nine (6) Tablets Fifteen (15)-gallon container stock Fifteen (10) Tablets 2.5” Caliper Stock Fifteen (15) Tablets 3”-4” Caliper Stock Twenty

1. Contractor shall not provide Fertilizer Tablets for designated native plant species, if directed by the Landscape Architect. Contractor shall verify with the Landscape Architect, in writing, as to which plants are subject to not receive the Fertilizer Tablets.

B. Mycorrhizal Inoculum Application Rate:

1. During application of Fertilizer/Planting Tablets, Mycorrhizal Inoculum shall be spread equidistantly around the perimeter within the Amended Planting Backfill Mixture, up to within three (3”) inches of the finished grade of the Mixture, at the prescribed application rate per the Manufacturer’s written recommendations.

3.6 DRAINAGE OF PLANTING AREAS

A. Surface Drainage:

1. Discrepancies: Provide proper surface drainage of planted areas. Submit in writing all discrepancies in the Contract Drawings or Specifications, or prior Work done by others, which Contractor feels precludes establishing proper drainage.
2. Correction: Include description of work required for correction or relief of said condition

B. Detrimental Drainage, Soils and Obstructions:

1. Notification: Submit in writing all soils or drainage conditions considered detrimental to growth of plant materials. State condition and submit proposal and cost estimate for correcting condition.
2. Correction: Submit for acceptance a written proposal and cost estimate for the correction before proceeding with Work.
3. Obstructions: If rock, underground construction Work, tree roots, or other obstructions are encountered in the performance of Work under this Section, submit cost required to remove the obstructions to a depth of not less than six-inches (6”) below the required soil depth.

3.7 MAINTENANCE

A. Protect graded areas from traffic and erosion. Keep free of trash and debris. Repair and reestablish grades in settled, eroded, and damaged areas.

B. Where completed areas are disturbed by construction operations or adverse weather, scarify surface, reshape, and compact to required density.

3.8 WASTE MATERIALS

A. Haul from site and legally dispose of waste materials including trash and debris as required and approved by the owner typical.

3.9 CLEAN UP

A. Upon completion of filling and grading work, remove equipment and tools. Leave site clear, clean, free of debris and ready for subsequent trades work.

END OF SECTION

SECTION 329200

TURF AND GRASSES

PART 1 - GENERAL

1.1 SUMMARY

A. Provide sodded lawns as shown and specified. The work includes:

1. Soil Preparation
2. Sodding lawns and other indicated areas.
3. Maintenance.

1.2 QUALITY ASSURANCE

A. Sod: Comply with American Sod Producers Association (ASPA) classes of sod materials.

B. Provide and pay for materials testing. Testing agency shall be acceptable to the Architect. Provide the following data:

1. Test representative materials samples proposed for use.
2. Topsoil:

a. pH factor.
b. Mechanical analysis.
c. Percentage of organic content.
d. Recommendations of type and quantity of additives required to establish satis-factory pH factor and supply of nutrients to bring nutrients to satisfactory level for planting.

1.3 INFORMATIONAL SUBMITTALS

A. Submit sod growers certification of grass species. Identify source location.

B. Submit the following materials certification:

1. Fertilizer(s) analysis.

C. Submit materials test report.

D. Upon sodded lawn acceptance, submit written maintenance instructions recommending procedures for maintenance of sodded lawns.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Cut, deliver, and install sod within a 24-hour period.

1. Do not harvest or transport sod when moisture content may adversely affect sod survival.
2. Protect sod from sun, wind, and dehydration prior to installation.
3. Do not tear, stretch, or drop sod during handling and installation.

1.5 FIELD CONDITIONS

A. Work notification: Notify Architect at least 7 working days prior to start of sodding operations.

B. Protect existing utilities, paving, and other facilities from damage caused by sodding operations.

C. Perform sodding work only after planting and other work affecting ground surface has been completed.

D. Restrict traffic from lawn areas until grass is established. Erect signs and barriers as required.

E. Provide hoses and lawn watering equipment as required.

1.6 WARRANTY

A. Provide a uniform stand of grass by watering, mowing, and maintaining lawn areas until final acceptance. Re sod areas, with specified materials, which fail to provide a uniform stand of grass until all affected areas are accepted by the Landscape Architect.

PART 2 - PRODUCTS

2.1 TURFGRASS SOD

A. Reference plan for turf material type.

B. Provide well-rooted, healthy sod, free of diseases, nematodes and soil borne insects. Provide sod uniform in color, leaf texture, density, and free of weeds, undesirable grasses, stones, roots, thatch, and extraneous material; viable and capable of growth and development when planted.

C. Fertilizer:

1. Granular, non-burning product composed of not less than 50% organic slow acting, guaranteed analysis professional fertilizer.

    a. Fertilizer with a ratio of 20-27-5 for establishing sod areas.
    b. Fertilizer with a ratio of 30-3-3 for maintaining the lawn.

D. Water: may not be available on site. Landscape contractor will provide necessary hoses and other watering equipment required to maintain and complete work. An automatic/drip irrigation system will be installed simultaneously with the landscape planting. The landscape contractor shall not anticipate the use of the irrigation system during installation of this contract.

E. Lime: Apply appropriate rate of pelleted lime as the pH test indicates. No lime is needed if the pH test is between 6.0-7.0.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine finish surfaces, grades, topsoil quality, and depth. Do not start sodding work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Limit preparation to areas which will be immediately sodded.

B. Loosen topsoil of lawn areas to minimum depth of 4". Remove stones over 1" in any dimension and sticks, roots, rubbish, and extraneous matter.

C. Grade lawn areas to smooth, free draining and even surface with a loose, uniformly fine texture. Roll and rake; remove ridges and fill depressions as required to drain.

D. Apply Type A fertilizer at the rate equal to 1.0 lb. of actual nitrogen per 1,000 sq. ft. (220 lbs./acre). Apply fertilizer by mechanical rotary or drop type distributor, thoroughly and evenly incorporated with the soil to a depth of 3" by disking or other approved methods. Fertilize areas inaccessible to power equipment with hand tools and incorporate it into soil. Buffalo Grass Sod may not require fertilizer submit soil test for review by Landscape Architect.

E. Dampen dry soil prior to sodding.

F. Restore prepared areas to specified condition if eroded, settled, or otherwise disturbed after fine grading and prior to sodding.

3.3 INSTALLATION

A. Sodding:

1. Lay sod per plans to form a solid mass with tightly-fitted joints. Butt ends and sides of sod strips. Do not overlay edges. Stagger strips to offset joints in adjacent courses. Remove excess sod to avoid smothering of adjacent grass. Provide sod pad top flush with adjacent curbs, sidewalks, drains, and seeded areas.
2. Do not lay dormant sod or install sod on saturated or frozen soil.
3. Install initial row of sod in a straight line, beginning at bottom of slopes, perpendicular to direction of the sloped area. Place subsequent rows parallel to and lightly against previously installed row.
4. Peg sod on slopes greater than 3 to 1 to prevent slippage at a rate of 2 stakes per yd. of sod.
5. Water sod thoroughly with a fine spray immediately after laying.
6. Roll with light lawn roller to ensure contact with sub-grade.

B. Sod indicated areas within contract limits and areas adjoining contract limits disturbed as a result of construction operations.

3.4 MAINTENANCE

A. Maintain sodded lawn areas, including watering, spot weeding, mowing, application of herbicides, fungicides, insecticides and resodding until a full,

uniform stand of grass free of weed, undesirable grass species, disease, and insects is achieved and accepted by the Architect at the completion and acceptance of the entire project.

1. Water sod thoroughly every 2 to 3 days, or as required to establish proper rooting.
2. Repair, rework, and resod all areas that have washed out or are eroded. Replace undesirable or dead areas with new sod.
3. Mow lawn areas as soon as lawn top growth reaches a 3" height. Cut back to 2" height. Repeat mowing as required to maintain specified height. Not more than 40% of grass leaf shall be removed at any single mowing.
4. Apply Type B fertilizer to lawns approximately 30 days after sodding at a rate equal to 2.0 lbs. of actual nitrogen per 1,000 sq. ft. (140 lbs./acre). Apply with a mechanical rotary or drop type distributor. Thoroughly water into soil. *Only as required per soil test for Buffalo Sod
5. Apply herbicides as required to control weed growth or undesirable grass species.
6. Apply fungicides and insecticides as required to control diseases and insects

3.5 ACCEPTANCE

A. Inspection to determine acceptance of sodded lawns will be made by the Architect, upon contractor's request at the completion of the entire project. Provide notification at least 10 working days before required inspection date.

1. Sodded areas will be acceptable provided all requirements, including maintenance, have been complied with, and a healthy, even colored viable lawn is established, free of weeds, undesirable grass species, disease, and insects.

B. Upon final acceptance, the Owner will assume lawn maintenance.

3.6 CLEANUP AND PROTECTION

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, debris, and equipment. Repair damage resulting from sodding operations.

END OF SECTION

SECTION 329300

PLANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide trees, shrubs, ground covers, native perennials, native grasses and native wildflower and grass seed as shown and specified.

1. Soil preparation.
2. Trees, shrubs, groundcovers, native perennials and native grasses.
3. Planting mixes.
4. Mulch and planting accessories.
5. Maintenance and Extended Management.

B. Related Requirements:

1. Section 015713: Temporary Erosion and Sediment Control
2. Section 328400 "Planting Irrigation" for complete irrigation systems.
3. Section 329200 "Turf and Grasses" for turf (lawn) and erosion-control materials.
4. Section 329400: Soil Preparation

C. Definitions:

1. Plant Material(s) – Refers to living plant species, inclusive of trees, shrubs, groundcovers, vines, ornamental grasses, cacti/succulents, espaliers, annuals, perennials, etc., as indicated in the Contract Drawings.
2. Planting Area (PA) – As denoted on the Contract Drawings, shall refer to areas to be installed with Plant Material(s), or areas where existing vegetation shall be protected.
3. Plant Height – Measurement of main body height, not measurement to branch tip.
4. Plant Spread – Measurement of main body diameter, not measurement from branch tip to branch tip.
5. Amended Planting Backfill Mixture – Refer to Section 32 91 13 – Soil Preparation.
6. Balled and Burlapped Stock – Healthy, vigorous exterior plants with firm, natural balls of earth in which they are grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of tree or shrub required; wrapped, tied, rigidly supported, and drum laced as recommended by ANSI Z60.1.
7. Balled and Potted Stock – Healthy, vigorous exterior plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of exterior plant required.
8. Bare-Root Stock – Healthy, vigorous exterior plants grown with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than minimum root spread according to ANSI Z60.1 for type and size of exterior plant required.
9. Compacted Settling Layer – Subgrade under where a plant is directly

planted.

10. Container-Grown Stock – Healthy, vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of exterior plant required.
11. Fabric Bag-Grown Stock – Healthy, vigorous, well-rooted exterior plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of exterior plant.
12. Finish Grade – Elevation of finished surface of planting soil.
13. Manufactured Topsoil – Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
14. Multi-Stem – Where three (3) or more main stems arise from the ground from a single root crown or at a point right above the root crown.
15. Sub-grade – Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.
16. Subsoil – All soil beneath the topsoil layer of the soil profile and typified by the lack of organic matter and soil organisms.

1.2 QUALITY ASSURANCE

A. Installer Qualifications:

1. Requirement: Valid Arkansas Landscaping Contractor License.
2. Engage an experienced Installer who has demonstrated completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful landscape establishment.
3. Installer's Field Supervision Installer shall maintain an experienced full-time supervisor on the Project site during times that landscaping installations under this Section are in progress.
4. Selections of Plant Material may be sourced and purchased by the Owner directly. Contractor to provide a line item installation cost and separate warranty identifying the schedule of values for each.

B. Plant Material:

1. Trees, Shrubs, Grasses and Seed: Provide quality, size, genus, species, and variety of Plant Material indicated, complying with applicable requirements of ANSI Z60.1 "American Standard for Nursery Stock."

    a. At least one (1) plant of each Plant Material species delivered to the Project Site shall have an identification tag from supplying nursery showing botanical and common name of the plant as identified in the Contract Drawings. Landscape Architect shall be provided the opportunity for an on-site debriefing by the Contractor that identifies the size and specific type of Plant Material upon delivery.

        1) Provide replacements equal to the size and quality to match the planted materials at the time the untrue species is discovered.

b. Replace, at no cost to Owner, Plant Material that is revealed during the course of the Contract as to being untrue to the species indicated in the Contract Drawings and reviewed accordingly under this Section.
c. Replacement of Plant Material: Refer to the Guarantee Article indicated herein this Section.

2. Native Wildflower and Grass seed: Provide quality seed and/or custom mix identified within the Construction Documents. Noxious weed seeds shall not exceed one-half (1/2) percent by weight of the total of pure live seed and other material in the mixture. Johnson Grass, nutgrass or other noxious weed seed will not be allowed.

a. At least one-half (1/2) pound of each seed/seed mix species delivered to the Project Site shall have an identification tag from supplying nursery showing botanical and common name of the plant as identified in the Contract Drawings. Landscape Architect shall be provided the opportunity for an on-site debriefing by the Contractor to verify the species of seed upon delivery.

1) Replacement of Plant Material: Refer to the Guarantee Article indicated herein this Section.

b. Incorrect Seed Materials:

1) Replace, at no cost to Owner, Seed that is revealed during the course of the Contract as to being untrue to the species indicated in the Contract Drawings and reviewed accordingly under this Section.
2) Provide replacement seed at the time the untrue species is discovered.

C. Plant Material Observation: Landscape Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Landscape Architect may also observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and may reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

D. Regulatory Requirements:

1. Contractor shall meet the requirements of applicable laws, codes, and regulations as required by the authorities having jurisdiction over the Work. Plant names indicated, comply with "Standardized Plant Names" as adopted by the latest edition of the American Joint Committee of Horticultural Nomenclature. Names of varieties not listed conform generally with names accepted by the nursery trade. Provide stock true to botanical name and legibly tagged.

E. Permits, Fees, Bonds, and Inspections: Contractor shall arrange and pay for permits, fees, bonds, and inspections necessary to perform and complete Work under this Section.

F. Plant Material Review and Selection (Tagging):

1. At the discretion of the Landscape Architect, Plant Material will be subject to review, photographed, and selected/tagged by the Landscape Architect at the nursery, or other place of growth, prior to delivery to the Project Site. Contractor shall verify with the Landscape Architect if tagging operations are required.
2. Selecting/Tagging of Plant Materials at the nursery or place of growth does not cancel the right of the Landscape Architect to reject Plant Materials at the Project Site, if damaged or unacceptable conditions are found that were not detected at the nursery, place of growth, or in the submitted photographs.

G. Plant Material Delivery: Plant Material shall be delivered with original Plant Material tagging materials set in place, as selected, and marked by the Landscape Architect at the nursery or place of growth. Seed, topdressing, and any fertilizer materials shall be delivered in original containers. Include materials showing weight, analysis, and names of growers. Store all seed material in a manner to prevent wetting, excessive heating, or other deterioration. Contractor shall notify Landscape Architect upon delivery of Plant Material for review of stock and tagging materials. Plant Materials delivered without original tagging materials, or with broken, damaged, or altered tagging materials, shall be subject to rejection by the Landscape Architect. Rejected Plant Material shall be removed immediately.

H. Pre-installation Conference: Conduct conference at Project Site.

I. Protection of Existing Plant Material:

1. Refer to Requirements specified in Section 015639 – Temporary Tree and Plant Protection.
2. It is the intent of the Contract Documents that certain existing Plant Materials shall be retained. Prior to the removal of any Plant Materials, the Contractor shall confer with the Landscape Architect to determine which Plant Materials are to remain.
3. All existing Plant Materials which are to remain in the project shall be tagged and identified by the Contractor prior to start of Work.
4. Contractor shall be responsible for Plant Materials that are designated to remain. Damage to any Plant Materials which results in death or permanent disfiguration of said Materials shall result in compensation outlined in Section 01 56 39 – Temporary Tree and Plant Protection. The Landscape Architect shall be the sole judge of the condition of the Plant Materials.
5. Existing Plant Materials designated to remain shall be protected at all times from damage by construction activity (tools, materials, equipment, personnel, etc.). Damage by the Contractor to existing Plant Materials shall be repaired at the Contractor’s expense to the satisfaction of the Owner, as directed by the Landscape Architect.
6. Contractor shall insure that no foreign material and/or liquid, such as paint, concrete, cement, oil, turpentine, acid or the like, be deposited or allowed to be deposited on soil within the drip line (the outside edge of the foliage overhang) of any Plant Material. Do not store construction materials, debris, or excavated material within drip line of existing Plant Material. Should any such poisoning of the soil occur, the Contractor shall thoroughly remove said soil as directed by the Landscape Architect and replace with acceptable soil at no additional cost to the owner.
7. Excavation adjacent to existing Plant Materials: Where it is necessary to excavate in close proximity to the drip lines of existing Plant Materials, all

possible caution shall be exercised to avoid injury to roots and trunk. Excavation close to Plant Materials shall be done by hand, with narrow-tine spading forks or other approved tools to comb soil to expose roots. Tunnel under roots two-inches (2") and larger in diameter. Cutting of roots two-inches (2") and larger shall be only on the approval of the Landscape Architect.

8. Replacement of Damaged Plant Material: Replace existing Plant Material to remain as required, hat are damaged by Contractor during construction with accepted Plant Material of the same species, size, and quantity as those damaged, at no additional cost to Owner. Owner shall be the sole judge as to the extent of the damage and the value of said damaged Plant Material.

1.3 SUBMITTALS

A. General

1. Collect information into a single submittal.
2. Submittal shall be organized and presented into specific sections or headings. Furnish neat, concise, legible, and clearly identifiable information, and sufficiently explicit detail, to enable proper evaluation for Contract compliance. Highlight catalog, product data, or brochures containing various products, sizes, and materials to show particular item submitted.
3. Submittal Format: As applicable, furnish Submittal as a single electronic digital PDF (Portable Document Format) file.

B. Digital Submittal Information:

1. Alphabetized List of Plant Material.
2. Submitted in the following format.

    a. Project Name
    b. Botanical Name
    c. Common Name
    d. Container Size
    e. Overall Height
    f. Caliper Size
    g. Quantity

3. The submittal shall not be construed as to acceptance of the plant material. All plant material shall be subject to review and approval by the Landscape Architect upon delivery to the project site.

C. No work shall proceed under this Section until submittal requirements indicated herein have been review accordingly by the Landscape Architect.

D. Provide plant material record drawings:

1. Legibly mark drawings to record actual construction.
2. Indicate horizontal and vertical locations, referenced to permanent surface improvements.
3. Identify field changes of dimension and detail and changes made by Change Order.

E. Submit for the Landscape Architect's approval five samples of each container grown plant under the number 15 container size. The five approved samples shall be retained in a protected location on the project site at a location approved by the General Contractor. The Landscape Contractor shall maintain the sample plants until completion of the site planting. The sample plants may then be used in the site planting.

1.4 DELIVERY, STORAGE, AND HANDLING

A. General: Do not prune Plant Material before delivery, except as approved by the Landscape Architect. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie Plant Material in such a manner as to destroy natural shape.

1. Immediately after digging field-grown Plant Materials, pack root systems in wet straw, hay, burlap, or other suitable material to keep root system moist until final planting installation.
2. Deliver freshly dug field-grown Plant Materials with firm, natural balls of earth of sufficient depth to include fibrous and feeding roots, meeting, or exceeding requirements of ANSI Z60.1 for root ball diameter.
3. Store all seed material in a manner to prevent wetting, excessive heat, or other deterioration.

B. Handling Plant Materials:

1. Handle balled and burlap Plant Material stock by the root ball.
2. Handle container-grown Plant Materials only by their containers.
3. DO NOT handle Plant Materials by their trunks or stems.
4. DO NOT drop any Plant Materials.
5. DO NOT bind or handle Plant Materials with wire or rope.
6. Pad trunk and branches of Plant Materials whenever using hoisting cables, chains, or straps.
7. Should the Contractor engage in handling any Plant Material(s) by any unacceptable method(s), the Landscape Architect shall reserve the right to reject any of the mishandled Plant Material(s). The Contractor shall replace rejected Plant Material(s) with approved Plant Material(s), at no additional cost to the Owner.

C. Delivery: Provide protective covering during delivery. Deliver Plant Material only after preparations for planting have been completed and install immediately. If planting is delayed more than six (6) hours after delivery, set Plant Materials in shade, protect from weather and mechanical damage, and keep roots moist. Anchor plants to prevent damage from winds.

1. Heel-in bare-root Plant Material stock. Soak roots in water for two (2) hours prior to planting.
2. Set balled Plant Material stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
3. DO NOT remove container-grown Plant Material stock from containers before time of planting.
4. Water root systems of Plant Material stored on site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

1.5 FIELD CONDITIONS

A. Work notification: Notify Architect at least 7 working days prior to installation of plant material.

B. Protect existing utilities, paving, and other facilities from damage caused by landscaping operations.

C. A complete list of plants, including a schedule of sizes, quantities, and other requirements is shown on the drawings. In the event that quantity discrepancies or material omissions occur in the plant materials list, the planting plans shall govern.

1.6 WARRANTY

A. Warrant plant material to remain alive and be in healthy, vigorous condition for a period of 1 year after completion and acceptance of entire project.

1. A review of plants will be made by the Architect at Substantial Completion and Final Completion.

B. Replace, in accordance with the drawings and specifications, all plants that are dead or, as determined by the Architect, are in an unhealthy or unsightly condition, and have lost their natural shape due to dead branches, or other causes such as bark abrasions and misuse of chemicals, due to the Landscape Contractor's negligence. The cost of such replacement(s) is at Landscape Contractor's expense. Warrant all replacement plants for 1 year after installation.

C. Warranty shall not include damage or loss of trees, plants, or ground covers caused by fires, floods, freezing rains, lightning storms, or winds over 75 miles per hour, winter kill caused by extreme cold and severe winter conditions not typical of planting area, acts of vandalism or negligence on the part of the owner.

D. Remove and immediately replace all plants, as determined by the Architect, to be unsatisfactory during the initial planting installation.

PART 2 - PRODUCTS

2.1 PLANT MATERIALS

A. Immediately upon award of Contract for Work in this Section, Contractor shall locate and purchase or hold for purchase plant material as required.

1. Contractor shall verify with Landscape Architect of Plant Material that has been nursery “contract grown” by the Owner for use of Work under this Contract.
2. Contractor shall review the condition of the Plant Material with Landscape Architect at the nursery maintaining the Plant Material prior to delivery, and when delivered to the Project Site.

B. Quality: Plant Materials shall have a growth habit typical for each variety and species indicated in the Plant List (as detailed on the Contract Drawings).

1. All Plant Materials specified shall be superior/premium-grade nursery stock, full, densely foliated, symmetrical, with tightly knit branching, so

trained or favored in development and appearance in form, number of branches, compactness and symmetry, healthy, and vigorous in growth, as reviewed and determined by the Landscape Architect

2. Plant Materials shall be free from insect pests, eggs and larvae, plant diseases, sun scalds, fresh bark abrasions, excessive abrasions, windburn, salt burn, weeds, or other disfigurements or conditions, as reviewed and determined by the Landscape Architect.
3. Plant Material shall be subject per the Arkansas State Department of Agriculture's Regulations for Nursery Inspections of Rules and Grading.
4. Growing Conditions: Plant Materials shall be nursery-grown in accordance with good horticultural practices under climatic conditions similar to those of project unless otherwise specifically authorized.

C. Container Stock (excluding annuals) shall be grown in boxes or containers in which delivered for at least one (1) growing season, but not over two (2) years. Plant Material grown in boxes or containers shall be cultivated during this time to permit full rooting within the specified box or container to bind the planting soil, but not so long as to create a "root-bound" condition.

1. Plant Material shall be completely free of circling, kinked or girdling trunk surface and center roots, and show no evidence of a pot-bound condition.
2. No boxed nor container Plant Material shall be planted which have cracked or broken balls of earth when separated from their boxes or containers.
3. No Plant Material shall be planted with damaged roots, broken root balls, or which are found to be "root-bound" when separated from their containers.

D. Pruning:

1. Do not prune Plant Materials unless directed by the Landscape Architect.
2. Pruning of Plant Material as grown at the nursery shall conform to ANSI A300 Standards.
3. Consult with Landscape Architect for pruning Plant Materials after delivery and installation.

E. Measurements: Measure Plant Material according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes.

1. Take caliper measurement at a point on the trunk six-inches (6") above natural ground line for trees up to four-inches (4") in caliper (at a point twelve-inches (12") above the natural ground line for trees over four-inches (4") in caliper).

   a. Measure foliage across mean foliage dimension when branches are in their normal upright position.
   b. For trees to be supplied in "raised up" condition, foliage origin along main trunk shall be measured from soil line after installation.
   c. Height and spread dimensions specified refer to main body of plant and not branch tip to tip. Properly trimmed plants shall measure the same in any direction. If a plant is unevenly grown, it shall be classified in the size category of the smallest dimension.

2. Size Range: If a range of size is given, do not use Plant Materials less

than the minimum size. The measurements specified are the minimum size acceptable and are the measurements after pruning, where pruning is required. Plant Materials that meet the measurements specified, but do not possess a normal balance between height and spread shall be rejected.

F. Field Dug Stock: Prior to digging of field-grown Plant Materials, ensure that excess loose fill resulting from cultivation around trunks/stems and over roots be removed down to natural finish grade at crown of Plant Materials. During digging, verify that size of tree spade or other equipment is adequate to encompass the actively growing root zone of all Plant Materials. Plant Materials which, after digging, show mostly large fleshy roots and few fibrous roots, will be rejected.

G. Condition of Root Systems: Plant Materials must prove to be completely free of circling, kinked or girdling trunk surface and center roots and show no evidence of a root-bound condition. Upon inspection by Landscape Architect at the job site, if five-percent (5%) or more of the plants of each species are found to contain kinked, circling or girdling roots, all plants of that species shall be rejected.

H. Unacceptable Trees: Trees that have damaged, broken, pruned, or crooked leaders will be rejected. Trees having a main leader shall not have been headed back. Trees with abrasions of the bark, sunscalds, disfiguring knots, or fresh cuts of limbs over 3/4 in. which have not completely callused will be rejected.

2.2 TREES

A. Shade and Flowering Trees: Single-stem trees with straight trunk, well-balanced crown, and intact leader, of height and caliper indicated, conforming to ANSI Z60.1 for type of trees required, subject to review and acceptance by the Landscape Architect. Container-grown trees will be acceptable and shall be subject to meeting ANSI Z60.1 limitation for container stock.

1. Branching Height: 1/2 of tree height, unless otherwise indicated on Contract Drawings.

B. Small Trees: Small upright or spreading type, branched, or pruned naturally according to species and type, and with relationship of caliper, height, and branching recommended by ANSI Z60.1, subject to review and acceptance by the Landscape Architect. Container-grown trees will be acceptable and shall be subject to meeting ANSI Z60.1 limitation for container stock.

1. Form: As indicated on the Contract Drawings for individual selected species.

C. Field Dug Specimen Trees:

1. Form and Size: As specified on the Contract Documents for height, spread, and/or caliper, subject to review and acceptance by the Landscape Architect at the supplying nursery prior to delivery and installation. Provide superior quality, full, symmetrical, well-rooted, upright, spreading, with well-balanced crown.
2. Throughout the duration of excavation, transport, delivery, storage, and installation, all Field Dug Specimen Trees shall have their root balls remain moist, firm and intact, with no damage. Provide metal cages, as required,

to insure root ball stability. Any tree that exhibits a broken, damaged, or dry root ball at any time under the Contract shall be subject to immediate rejection by the Landscape Architect.

2.3 SHRUBS

A. Form and Size: Shrubs with not less than the minimum number of canes required by and measured according to ANSI Z60.1 for type, shape, and height of Shrub, subject to review and acceptance by the Landscape Architect. Container-grown Shrubs will be acceptable in lieu of balled and burlapped.

1. Container-grown Shrubs shall be subject to meeting ANSI Z60.1 limitations for container stock, and other requirements as indicated on the Contract Drawings.

2.4 CONIFEROUS EVERGREENS

A. Form and Size: Normal-quality, well-balanced, well-rooted, coniferous evergreens, of type, height, spread, and shape required, subject to review and acceptance by the Landscape Architect.

1. Boxed or container-grown coniferous evergreens will subject to meeting ANSI Z60.1 limitations for container stock, and other requirements as indicated on the Contract Drawings.

2.5 BROADLEAF EVERGREENS

A. Form and Size: Normal-quality, well-balanced, well-rooted , broadleaf evergreens, of type, height, spread, and shape required, subject to review and acceptance by the Landscape Architect.

1. Container-grown broadleaf evergreens shall be subject to meeting ANSI Z60.1 limitations for container stock, and other requirements as indicated on the Contract Drawings.

2.6 GROUNDCOVERS

A. Provide ground covers full, established, and well-rooted in removable flats, containers, or integral peat pots, and with not less than the minimum number and length of runners required by ANSI Z60.1 for the container size indicated, and other requirements as indicated on the Contract Drawings, subject to review and acceptance by the Landscape Architect.

2.7 NATIVE GRASSES AND PLUGS

A. Form and Size: High-quality, established, full, well-balanced, well-rooted, of type, height, spread, and shape required, subject to review and acceptance by the Landscape Architect.

1. Container-grown stock shall be subject to meeting ANSI Z60.1 limitations for container stock.

2.8 PERMANENT SEEDING

A. Quantity/Weight per plans. An approved combination of Wildflower Seeds and

Native Grass seed shall be supplied as custom mixes identified within the Construction Documents. Procure local genotype seed when and if available. Seed must be collected by lawful means and must come from a similar geographic region.

B. Erosion Control Blankets for slopes greater than or equal to 3:1:

1. Bio-D-Mat 40 by Rolanka International, Inc. or approved equal.

2.9 PLANT LIST

A. The plant list including quantities is located on the plans and is for reference only. It is the responsibility of the contractor to determine total quantities in conformance with the plans. Height of plants specified and height of lowest branches of trees is above soil line.

PART 3 - EXECUTION

3.1 INSPECTION

A. No work under this section shall commence until submittals under this section have been reviewed accordingly by the Landscape Architect.

B. Prior to commencing Work under this Section, Contractor shall examine previously installed Work from other trades and verify that such Work is complete and to the point where Work herein may commence properly. Do not proceed with Work until unsatisfactory conditions have been corrected.

C. Installation practices of the Plant Materials shall be performed during those periods when weather and soil conditions are suitable and in accordance with locally accepted horticultural practices, as judged by the Landscape Architect.

1. Soil moisture levels prior to planting shall be no less than seventy-five-percent (75%) of field capacity. The determination of adequate soil moisture for planting shall be in the sole judgment of the Landscape Architect, and their decision shall be final.

a. If the soil moisture level is found to be insufficient for planting installation, planting pits shall be filled with water and allowed to drain before commencing planting operations.
b. Any planting area that may become compacted in excess of eighty-five-percent (85%) relative compaction (due to construction operations or other activities during the Contract) shall be tilled and thoroughly cross-ripped to a minimum depth of nine-inches (9”) to alleviate the condition, taking care to avoid all existing subsurface utilities, drainage, etc.
c. Do not commence planting installation prior to acceptance of Section 329113 –Soil Preparation.

D. Contractor shall notify the Landscape Architect, in writing, on the anticipated commencement date and length of duration of the landscape installation.

E. Preparation of Planting Installation: Lay out individual Plant Material locations and areas for multiple plantings. Stake locations, outline areas, and gain the Landscape Architect’s acceptance prior to commencing physical planting

installation.

F. At the discretion of the Landscape Architect, Contractor shall make field adjustments to the planting layout, as required, per the direction of the Landscape Architect. Layout changes made accordingly shall be performed at no additional cost to the Owner.

G. No more Plant Materials shall be distributed in the planting area on any day than can be installed and watered on that day. Plant Materials shall be planted and watered immediately after the removal of their containers, as applicable.

H. Contractor shall protect existing and new improvements and systems installed prior to planting installation. Maintain protection in place until completion of Work and Landscape Establishment Period.

I. Finish Grades for planting areas shall have been established (per Section 31 22 19 – Landscape Grading) prior to Work under this Section. Verify that grades are within one-inch plus or minus (1”+/-) of the required finish grade, and that all proper soil amendments and fertilizers have been furnished and installed accordingly as specified (per Section 329113 – Soil Preparation).

1. Maintain positive surface drainage of all planted areas throughout the duration of the Contract.

J. Pre-Planting: Where Plant Materials are to be pre-planted to permit site improvements to be installed around them, Contractor shall be responsible for the accurate layout and placement of those Plant Materials, as measured to their centerlines. Confirm designated pre-planting operations with Landscape Architect prior to commencing Work. Contractor shall also be responsible for the protection of pre-planted Plant Materials while other Work is taking place around them. Provide automated irrigation, as necessary, prior to installation and functioning of irrigation systems (per Section 32 84 00 – Irrigation Systems).

3.2 EXCAVATION FOR PLANT MATERIALS

A. General: Upon completion of applicable pre-planting soil preparation requirements indicated in Section 32 91 13 – Soil Preparation, excavate planting hole(s) for Plant Material with scarified vertical sides, with the bottom of the excavated hole slightly raised and compacted at the center to assist drainage and to minimize settlement of the Plant Material. Excavate holes according to the spacing alignment (i.e. hedge spacing, grid spacing, triangular spacing, etc.) and the on-center (O.C.)

B. Planting areas that have not been excavated prior to planting.

1. Plug Plant Material:

a. Excavate at least four-inches (1”) wider than the perimeter of the plug, and deep enough to allow setting of the roots on a compacted layer of native planting soil, where the top of the plant’s root collar is one half-inch (1/2”) higher than finished grade or as further directed by the Landscape Architect

2. Balled and Burlap Plant Material:

a. Excavate the planting hole to the width and depth indicated in the Contract Drawings. Depth of the planting hole includes the depth indicated for the compacted setting layer at the bottom of the excavation, where the top of the plant's root collar is two-inch (2") higher than finished grade or as further directed by the Landscape Architect
b. Compacted Setting Layer: Provide a crown of a minimum six-inch (6") depth of native planting soil.

3. Container-Grown Plant Material:

a. Excavate the planting hole to the width and depth indicated on the Contract Drawings. Depth of the planting hole includes the depth indicated for the compacted setting layer at the bottom of the excavation, where the top of the plant's root collar is two-inch (2") higher than finished grade or as further directed by the Landscape Architect:
b. Compacted Setting Layer: Provide a crown of a minimum six-inch (6") depth of native planting soil.

4. Field Grown/Specimen Trees:

a. Excavate the planting hole to the width and depth indicated on the Contract Drawings. Depth of the planting hole includes the depth indicated for the compacted setting layer at the bottom of the excavation, where the top of the plant's root collar is three-inch (3") higher than finished grade or as further directed by the Landscape Architect
b. Compacted Setting Layer: Provide a crown of a minimum six-inch (6") depth of native planting soil.
c. In areas where special subsurface drainage for planting is indicated, tie drainage pipes, as required, into the drain system.
d. Excavate planting hole at 3x the diameter of the rootball.

5. Permanent Seeding

a. Lightly scarify existing topsoil and place seed directly on existing soil.
b. When existing topsoil has been removed during grading operations, place a minimum of three-inches (2") of topsoil (Reference Section 32 91 13) to provide an acceptable seeding substrate.

C. Obstructions: Notify the Landscape Architect immediately if unexpected rock, debris, contaminants, obstructions, or other items that are detrimental to the healthy sustained growth of Plant Material is encountered in the excavation process.

1. Hardpan Layer: If encountered, drill six-inch (6") diameter holes into free-draining strata or to a depth of ten-feet (10'), whichever is less, and backfill with free-draining material.

D. Drainage: Notify the Landscape Architect if subsoil conditions show evidence of unexpected water seepage or retention in planting holes.

E. Time of planting:

1. Evergreen material: Plant evergreen materials between September 1 and November 1 or in spring before new growth begins. If project requirements require planting at times, other than winter months, plants shall be sprayed with anti-desiccant prior to planting operations.
2. Deciduous material: Plant deciduous materials in a dormant condition. If deciduous trees are planted in-leaf, they shall be sprayed with an anti-desiccant prior to planting operation.

3.3 INSTALLATION

A. Plug Plant Material: Set Plug Plant Material plumb and in center of the excavated hole, with top of root structure set properly at the adjacent finish grade as indicated. Set Plug Plant Material in the proper spacing and/or alignment(s) as indicated on the Contract Documents, or as further directed at the Project Site by the Landscape Architect.

1. Thoroughly soak the roots in clean water for a minimum of two (2) hours but no more than four (4) hours to fully hydrate the root mass. Do not soak above the root crown.
2. Carefully place the Plant Material stock on the specified setting layer of compacted native soil, with the top of root mass set approximately one half-inch (1/2”) above the finished grade to allow for settlement of the Plant Material within the excavated planting hole. Provide an orientation of the Plant Material that is confirmed and acceptable by the Landscape Architect.
3. Prepare the Amended Planting Backfill Mixture: Amend each cubic yard (cu/yd) of native soil excavated from the planting hole by incorporating and thoroughly mixing/blending the following:

    a. ¼ yard of Bulk Composted Organic Soil Amendment Material (per Section 32 91 13 – Soil Preparation).
    b. ½ pound of Granular Soil Conditioning Material & Fertilizer (per Section 329113–Soil Preparation).
    c. Add Mycorrhizal Inoculum to the excavated native soil, (per Section 329113 – Soil Preparation), per the Manufacturer’s latest printed instructions.

        1) Pending the results of the Agronomic Soil Fertility Report, the Amended Planting Backfill Mixture may be modified accordingly to include additional soil amendments or fertilizers (gypsum, iron, potash, etc.) or the ratios as indicated in the Mixture indicated above may be modified.

            a) The cost of providing modifications to the Amended Planting Soil Backfill Mixture (as recommended through the Agronomic Soil Fertility Report and as directed by the Landscape Architect) shall be borne by the Contractor.

4. Backfilling the excavated planting hole:

    a. Place the Amended Planting Backfill Mixture around the Plant Material root mass in the excavated planting hole. Place the Mixture in six-inch (6”) lifts, tamping each lift accordingly to settle the Mixture and eliminate voids and air pockets.

b. Maintain the Plant Material plumb while working the Mixture around the root mass. When the planting hole is approximately half-backfilled, water thoroughly before placing the remainder of the Mixture.
c. Add the Fertilizer Tablets and other amendments, (per Section 329113 – Soil Preparation) as required, at the prescribed application rates (as indicated per Section 329113 – Soil Preparation) or if not indicated, per the Manufacturer's latest printed instructions.
d. Place the final layers of the Amended Planting Backfill Mixture, tamping accordingly, to the top of the root mass.
e. Dish and tamp top of the Mixture to form a three-inch (3") deep watering basin centered on the Plant Material's trunk to the rim width of the planting hole.
f. Thoroughly mix together water and Plant Vitamin/Hormone Stimulant in application ratio as recommended by Stimulant Manufacture . Apply liquid matrix in sufficient quantity to thoroughly saturate the basin to settle the Mixture, and to eliminate voids and air pockets. Should any portions of the root mass be exposed, add additional Mixture as needed to thoroughly cover the root mass.

5. Mulching: Apply mulch evenly at 1" at all plug installation locations.

B. Balled and Burlapped Plant Material: Set the Balled and Burlapped Plant Material plumb and in center of the excavated hole, with top of the root ball raised above adjacent finish grade as indicated. Set Balled and Burlapped Plant Material in the proper spacing and/or alignment(s) as indicated on the Contract Documents, or as further directed at the Project Site by the Landscape Architect.

1. Carefully place the Balled and Burlapped Plant Material stock on the specified setting layer of compacted native soil, with the top of root ball set two-inch (2") above the finished grade to allow for settlement of the Plant Material within the excavated planting hole. Provide the orientation of the Plant Material that is confirmed and accepted by the Landscape Architect. During the process of determining an acceptable orientation of the Plant Material, handle the Plant Material by its root ball; avoid handling the Plant Material by its trunk.
2. Once orientation is accepted, carefully remove the burlap and wire baskets from the tops of the root ball and partially from the sides, but do not remove from under the root ball. Do not damage the root ball or any part of the plant. Plant Material shall be rejected if the root ball is cracked or broken before or during the planting operation.
3. Prepare the Amended Planting Backfill Mixture: Amend each cubic yard (cu/yd) of native soil excavated from the planting hole by incorporating and thoroughly mixing/blending the following:

a. ¼ yard of Bulk Composted Organic Soil Amendment Material (per Section 32 91 13 – Soil Preparation).
b. ½ pound of Granular Soil Conditioning Material & Fertilizer (per Section 32 91 13– Soil Preparation).
c. Add Mycorrhizal Inoculum to the excavated native soil, (per Section 32 91 13 –Soil Preparation), per the Manufacturer's latest printed instructions.

4. Backfilling the excavated planting hole:

a. Place the Amended Planting Backfill Mixture around the root ball in

the excavated planting hole. Place the Mixture in six-inch (6") lifts, tamping each lift accordingly to settle the Mixture and eliminate voids and air pockets.

b. Maintain the plant plumb while working the Mixture around the root ball. When the planting hole is approximately half-backfilled, water thoroughly before placing the remainder of the Mixture.
c. Add the Fertilizer Tablets and other amendments, (per Section 32 91 13 – Soil Preparation) as required, at the prescribed application rates indicated herein this Article or if not indicated, per the Manufacturer's instructions.
d. Place the final layers of the Mixture, tamping accordingly, to the top of the root ball. Do not place the Mixture on top of the root ball. Pull soil away and exposed root flare. Ensure root flare is planted above finished grade.
e. Dish and tamp top of the Mixture to form a three-inch (3") deep watering basin centered on the Plant Material's trunk to the rim width of the planting hole. Do not cover the top of the root ball with the backfill mixture.
f. Thoroughly mix water and Plant Vitamin/Hormone Stimulant in application ratio as recommended by Stimulant Manufacture. Apply liquid matrix in sufficient quantity to thoroughly saturate the basin to settle the Mixture, and to eliminate voids and air pockets. Should any portions of the root mass be exposed, add additional Mixture as needed to thoroughly cover the root mass.

5. Mulching: Apply mulch in watering basins as indicated on the Contract Drawings. Refer to Section 32 94 00 – Landscape Planting Accessories for type and requirements.
6. Wrapping:

a. Inspect trees for injury to trunks, evidence of insect infestation, and improper pruning before wrapping.
b. Wrap trunks of all trees as directed spirally from bottom to top with specified tree wrap and secure in place.
c. Overlap 1/2 the width of the tree wrap strip and cover the trunk from the ground to the height of the second branch.
d. Secure tree wrap in place with twine wound spirally downward in opposite direction, tied around the tree in at least 3 places in addition to the top and bottom.

7. Staking/guying:

a. Stake/guy all trees immediately after each tree planting.
b. Stake all trees and all multi-trunk trees.
c. Flag or color all cables.
d. All work shall be acceptable to the Landscape Architect.

C. Container-Grown and Ball and Burlap Plant Material: Set Plant Material plumb and in the center of the excavated planting hole, with top of the root ball raised above adjacent finish grade as indicated. Set Plant Material in the proper spacing and/or alignment(s) as indicated on the Contract Documents, or as further directed at the Project Site by the Landscape Architect.

1. For plastic container stock (4" pot, 1-gallon, 5-gallon, 15-gallon, etc.), carefully remove the plant container prior to setting the plant in the excavated hole so as not to damage root ball. Tip container to horizontal

position and shake carefully to remove Plant Material. Support root ball during installation to prevent cracking or shedding of soil.

2. Set the Plant Material stock on the specified setting layer of compacted native soil, with the top of root ball set one-inch (1") above the finished grade to allow for settlement of the Plant Material within the excavated planting hole. Provide the orientation of the Plant Material that is confirmed and accepted by the Landscape Architect. During the process of determining an acceptable orientation of the plant material, carefully handle the Plant Material by its container; avoid handling the Plant Material by its trunk.

    a. Plant Material with a damaged root ball upon removal of the container, or if the root ball fails to thoroughly hold the soil as it is removed from the container, or if the plant is mishandled or damaged during planting operations, shall be rejected.

3. For Ball and Burlap stock, carefully set whole root ball of the Plant Material stock on the specified setting layer of compacted native soil, with the top of root ball set two-inch (2") above the finished grade to allow for settlement of the Plant Material within the excavated planting hole. Provide the orientation of the Plant Material that is confirmed and accepted by the Landscape Architect. During the process of determining an acceptable orientation, carefully handle the Plant Material by its basket; avoid handling the Plant Material by its trunk or branches. Once orientation is accepted, remove 1/3 of the wire basket so as not to damage the root ball or any part of the plant. Do not remove the bottom of the wire basket. Discard top 1/3, do not bend back or bury.

    a. Plant Material with a damaged root ball upon placing/planting, or if the root ball fails to thoroughly hold the soil as it is planted, or if the plant is mishandled or damaged during planting operations, shall be rejected.

4. Prepare the Amended Planting Backfill Mixture: Amend each cubic yard (cu/yd) of native soil excavated from the planting hole by incorporating and thoroughly mixing/blending the following:

    a. ¼ yard of Bulk Composted Organic Soil Amendment Material (per Section 32 91 13 – Soil Preparation).
    b. ½ pound of Granular Soil Conditioning Material & Fertilizer (per Section 32 91 13– Soil Preparation).
    c. Add Mycorrhizal Inoculum to the excavated native soil, (per Section 32 91 13 –Soil Preparation), per the Manufacturer's latest printed instructions.

        1) Pending the results of the Agronomic Soil Fertility Report, the Amended Planting Backfill Mixture may be modified accordingly to include additional soil amendments or fertilizers (gypsum, iron, potash, etc.) or the ratios as indicated in the Mixture indicated above may be modified.

            a) The cost of providing modifications to the Amended Planting Soil Backfill Mixture (as recommended through the Agronomic Soil Fertility Report and as directed by the Landscape Architect) shall be borne by

the Contractor.

5. Backfilling the excavated planting hole:

   a. Place the Amended Planting Backfill Mixture around the root ball in the excavated planting hole. Place the Mixture in six-inch (6”) lifts, tamping each lift accordingly to settle the Mixture and eliminate voids and air pockets. Foot tamp the backfill, as required.
   b. Maintain the plant plumb while working the Mixture around the root ball. When the planting hole is approximately half-backfilled, water thoroughly before placing the remainder of the Mixture.
   c. Add the Fertilizer Tablets and other amendments (per Section 32 91 13 – Soil Preparation) as required, at the prescribed application rates indicated herein this Article or if not indicated, per the Manufacturer’s instructions.
   d. Place the final layers of the Mixture, tamping accordingly, to the top of the root ball. Do not place the Mixture on top of the root ball.
   e. Dish and tamp top of the Mixture to form a three-inch (3”) deep watering basin centered on the Plant Material’s trunk to the rim width of the planting hole. Do not cover the top of the root ball with the backfill mixture.

6. Mulching: Apply mulch in watering basins as indicated on the Contract Drawings. Refer todrawings for type and requirements.
7. Wrapping:

   a. Inspect trees for injury to trunks, evidence of insect infestation, and improper pruning before wrapping.
   b. Wrap trunks of all trees as directed spirally from bottom to top with specified tree wrap and secure in place.
   c. Overlap 1/2 the width of the tree wrap strip and cover the trunk from the ground to the height of the second branch.
   d. Secure tree wrap in place with twine wound spirally downward in opposite direction, tied around the tree in at least 3 places in addition to the top and bottom.

8. Staking/guying:

   a. Stake/guy all trees immediately after each tree planting.
   b. Stake all trees and all multi-trunk trees.
   c. Flag or color all cables.
   d. All work shall be acceptable to the Landscape Architect.

D. Native Wildflower and Grass Seed Material: Hydroseed per volumes specified within the Construction Documents. Apply native grass and wildflower seed after ground preparation is complete between September 15 and October 15 or February 15 and March 15. Landscape Architect shall be consulted prior to seeding to review preparation and installation.

1. Seed as follow to ensure complete coverage as noted:

   a. Finish grade with 2” depth of topsoil in areas that receive seed. Eliminate low areas that may hold water.
   b. Restore prepared areas to specified condition if eroded, settled, or otherwise disturbed after fine grading and prior to seeding.

c. Place of one-half inch (1/2”) organic compost spread evenly over finished grade by Landscape Contractor.
d. Prior to seeding roll and rake, remove ridges, remove sticks, rubbish, and extraneous matter.
e. Seed immediately after the preparation of bed. Do not spray outside of seed areas as indicated on the Landscape Plans; protect all areas not scheduled to receive hydroseed.
f. Allow seed to have direct contact with the compost. Do not bury.
g. On all slopes 3:1 or greater, erosion control blankets shall be installed over seed areas as indicated on the plans by the Landscape Contractor using biodegradable stakes.
h. Wood cellulose fiber hydromulch shall be sprayed over seeded areas at the rate of 75 lbs. per 1000 square feet, providing a uniform cover after hydroseed with direct contact with soil. Only provide hydromulch in areas without erosion control blankets.
i. Remove and clean immediately all hydromulch from walls, trees, shrubs, curbs, pavement, fire hydrants, light and utility poles and other site improvements immediately after hydromulch operation.

3.4 PRUNING AND THINNING OF PLANT MATERIAL

A. Pruning/Thinning of Tree Canopy

1. At no time shall Plant Material be pruned, trimmed, thinned, shaped, or topped prior to delivery. Pruning, trimming, thinning, shaping, or topping of Plant Material shall be only conducted on the Project Site, and under the presence and direction of the Landscape Architect or approved Certified Arborist. Plant Material that has been pruned and delivered to the Project Site without prior approval by the Landscape Architect or an approved Certified Arborist will be rejected.

B. When directed by the Landscape Architect or an approved Certified Arborist, Contractor shall prune, thin, and shape plant material, according to standard horticultural practice, to preserve the natural character of the Plant Material.

1. Pruning and remedial work shall be done per ANSI A300.
2. Prune trees to retain required height and spread. Do not cut tree leaders; remove only injured or dead branches from trees.
3. Prune shrubs accordingly to retain natural character.
4. Provide pruning, cabling and bracing, irrigation, pest and disease control and other remedial treatments as recommended to assure the long-term health of the trees and existing vegetation, and the safety of persons and property.
5. Newly planted trees shall be pruned near the termination of the Landscape Establishment Period, per the direction of the Landscape Architect, as required.

3.5 CLEANING AND PROTECTION

A. During installation operations, keep Work area in an orderly and safe condition. Contractor shall remove trash caused from his Work on a weekly basis throughout the duration of the Work.

B. Protect plants from damage due to landscape operations and operations of other contractors and trades, and trespassers. Maintain protection during installation

and maintenance periods. Treat, repair, or replace damaged plantings.

C. Upon completion of his Work under this Section, the Contractor shall remove rubbish, waste, debris, excess construction materials, surplus soil and other items resulting from construction operations and legally dispose of it off the Owner's property.

D. Scars, ruts, or other marks in the ground caused by the Contractor's Work shall be repaired.

E. Remove equipment and implements of service and leave the entire Project Site area in a neat, clean, and Owner-approved condition.

F. Labels: Remove all nursery-type labels, flags, and or identification markings from Plant Materials AS DIRECTED BY THE Landscape Architect.

3.6 PLANT MAINTENANCE

A. Maintain the trees, shrubs, groundcovers, perennials, native grasses until Final Completion of the entire project. Upon Final Completion, the Owner will assume maintenance as recommended by the written maintenance instructions submitted by the Landscape Contractor for Sodded areas only.

B. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, application of appropriate insecticides and fungicides necessary to maintain plants free of insects and disease, and performing other operations as required to establish healthy, viable plantings.

C. Re-set settled plants to proper grade and position. Restore planting saucer and adjacent material and remove dead material.

D. Correct defective work as soon as possible after deficiencies become apparent and weather and season permit.

E. Deep-water trees, plants, groundcover, perennial and native grass beds within the first 24 hours of initial planting, and thereafter as required for healthy growth until final acceptance.

3.7 SUBSTANTIAL COMPLETION

A. An inspection of the trees, shrubs, groundcovers, perennials and native grasses will be made by the Landscape Architect upon request for Application of Substantial Completion by the Landscape Contractor. Provide notification of at least five (5) working days before requested inspection date.

3.8 FINAL COMPLETION

A. An inspection of the trees, shrubs and ground covers will be made by the Landscape Architect upon request for Final Completion by the Landscape Contractor.

END OF SECTION

SECTION 329400

HYDROSEEDING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide seeded lawns as shown and specified. The work includes:

1. Soil preparation.
2. Hydroseeing
3. Maintenance.

1.2 QUALITY ASSURANCE

A. Provide and pay for materials testing. Testing agency shall be acceptable to the owner.

B. Provide the following data:

1. Test representative material samples proposed for use.
2. Topsoil:

    a. pH factor.
    b. Mechanical analysis.
    c. Percentage of organic content.
    d. Recommendations on type and quantity of additives required to establish satisfactory pH factor and supply of nutrients to bring nutrients to satisfactory level for planting.

1.3 SUBMITTALS

A. Submit seed vendor's certification for required grass seed mixture, indicating percentage by weight, 100% PLS, germination, and weed seed for each grass species as indicated on plans.

B. Submit the following material samples:

1. Seed
2. Hydromulch

C. Submit the following materials certification:

1. Fertilizer(s) analysis
2. Tackifier

    a. Submit materials test report.

D. Upon seeded lawn review, submit written maintenance instructions recommending procedures for maintenance of seeded lawns.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver seed and fertilizer materials in original unopened containers, showing weight, analysis, and name of manufacturer. Store in a manner to prevent wetting and deterioration.

1.5 PROJECT CONDITIONS

A. Work notification: Notify Owner at least 7 working days prior to start of seeding operations.

B. Protect existing utilities, paving, and other facilities from damage caused by seeding operations.

C. Perform seeding work only after planting and other work affecting ground surface has been completed.

D. Restrict traffic from lawn areas until grass is established. Erect signs and barriers as required.

E. Provide water, hose and lawn watering equipment as required.

1.6 WARRANTY

A. Provide a uniform stand of grass by watering, mowing, and maintaining seeded areas until final acceptance. Reseed areas, with specified materials, which fail to provide a uniform stand of grass until all affected areas are reviewed by the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Lawn seed: Fresh, clean, and new crop seed mixture.

1. Hydromulched Common Bermuda grass seed (Cynodon dactylon) shall be high quality, extra fancy, hulled and treated lawn type seed, at 98% purity and 85% germination, delivered to site in original and unopened containers meeting all requirements of the Arkansas State Seed Law.
2. Hydromulched Annual Rye shall be of high quality, extra fancy, hulled and treated lawn type seed, at 98% purity and 90% germination, meeting all requirements of the Arkansas State Seed Law.
3. Hydromulched Browntop Millet shall be of high quality, extra fancy, hulled and treated lawn type seed, at 98% purity and 90% germination, meeting all requirements of the Arkansas State Seed Law
4. Noxious weed shall not exceed 1/2 per cent by weight of the total pure alive seed and other material in the mixture. Containers containing Johnson grass, nutgrass or other noxious weed seed shall be rejected.

B. Fertilizer: Granular, non-burning product composed of not less than 50% organic slow acting, guaranteed analysis professional fertilizer.

1. Type A: Starter fertilizer containing 20% nitrogen, 26% phosphoric acid, and 6% potash by weight, or similar approved composition.
2. Type B: Top dressing fertilizer containing 31% nitrogen, 3% phosphoric

acid, and 10% potash by weight or similar approved composition.

C. Wood cellulose fiber mulch: Degradable green dyed wood cellulose fiber or 100% recycled long fiber pulp, free from weeds or other foreign matter toxic to seed germination and suitable for hydromulching.

D. Tackifier: Liquid concentrate diluted with water forming a transparent 3 dimensional film like crust permeable to water and air and containing no agents toxic to seed germination.

E. Water: Free of substance harmful to seed growth. Hoses or other methods of transportation furnished by contractor.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine finish surfaces, grades, topsoil quality, and depth. Do not start seeding work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Limit preparation to areas which will be immediately seeded.

B. Loosen topsoil of lawn areas to minimum depth of 4". Remove stones over 1" in any dimension and sticks, roots, rubbish, and extraneous matter.

C. Grade lawn areas to a smooth, free draining even surface with a loose, moderately coarse texture. Roll and rake, remove ridges, and fill depressions as required to drain.

D. Restore prepared areas to specified condition if eroded, settled, or otherwise disturbed after fine grading and prior to seeding.

3.3 INSTALLATION

A. Hydroseed as follows to ensure complete coverage as noted:

1. Seed:

a. Bermuda seed – 6 lbs per 1000 square feet.

1) Seeding completed between April 01 and September 30th.

b. Annual Rye seed – 6 lbs per 1000 square feet.

1) Seeding completed between October 1 and March 30th.

2. Wood Cellulose fiber hydromulch – 75 lbs. per 1000 square feet. Spray after seed is placed ensuring direct contact with soil. Only provide wood cellulose fiber mulch in areas without erosion control blankets.
3. Erosion control blankets on all slopes 3:1 or greater:

a. BioD-Mat 40 – Rolanka International, Inc. or approved equal.

B. Seed all grass areas, unless otherwise indicated, within limit of construction and areas adjoining seeding limit of construction as a result of seeding operation.

C. Seed immediately after preparation of bed. Do not spray outside of lawn areas; protect all areas not scheduled to receive hydroseed.

D. Remove and clean immediately all hydromulch from walls, trees, shrubs, curbs, pavement, fire hydrants, light and utility poles and other site improvements immediately after hydromulch operation.

E. Hydromulch shall be sprayed over the tilled soil providing a uniform cover.

F. Should Annual Rye grass be seeded, the Contractor shall return to the site on a date as approved by Owner, to remove by mowing to the ground all traces of the Annual Rye. The Landscape Contractor shall then prepare the area for seeding as specified in Part 3.2 of this section. Immediately thereafter, hydroseed and establish the Grass as specified.

G. The Owner and Landscape Architect shall be consulted prior to seeding to review hydroseeding installation.

3.4 MAINTENANCE

A. Maintain the seeded lawns until Substantial Completion of the entire project. Upon Substantial Completion, the Owner will assume lawn maintenance as recommended by the written maintenance instructions submitted by the Landscape Contractor.

B. Water 2 times a week or as required to maintain adequate surface soil moisture for proper seed germination. Continue watering or as required for not less than 30 days. Thereafter apply 1/2" of water twice weekly or as required until acceptance.

C. Repair, rework, and re-seed all areas that have washed out, are eroded, or do not catch.

D. Maintain seeded banks, ditches, medians, and fields to the extent of establishment only. Re-grade and re-seed washed out or eroded areas as required until a suitable cover is established.

3.5 SUBSTANTIAL COMPLETION

A. An inspection of the seeded lawns will be made by the Owner upon request for Application of Substantial Completion by the Landscape Contractor. Provide notification at least five (5) working days before requested inspection date.

3.6 FINAL COMPLETION

A. An inspection of the seeding will be made by the Owner upon request for Final Completion. Provide notification of at least five (5) working days before requested inspection date. Seeded areas will be acceptable provided all requirements, including maintenance, have been complied with, and a healthy, uniform, close stand of the specified grass is established free of weeds, undesirable grass species, disease, and insects.

B. No individual lawn areas shall have bare spots or unacceptable cover totaling more than 2% of the individual areas, in areas requested to be inspected.

3.7 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, debris, and equipment. Repair damage resulting from seeding operation.

END OF SECTION

SECTION 330500

COMMON WORK RESULTS FOR UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Piping joining materials.
2. Dielectric fittings.
3. Sleeves.
4. Identification devices.
5. Grout.
6. Piping system common requirements.
7. Concrete bases.
8. Metal supports and anchorages.

1.2 DEFINITIONS

A. Exposed Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.

B. Concealed Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Dielectric fittings.
2. Identification devices.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Steel Piping Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

PART 2 - PRODUCTS

2.1 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness, unless otherwise indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

D. Solder Filler Metals: ASTM B32, lead-free alloys. Include water-flushable flux according to ASTM B813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

G. Solvent Cements for Joining Plastic Piping:

1. ABS Piping: ASTM D2235.
2. CPVC Piping: ASTM F493.
3. PVC Piping: ASTM D2564. Include primer according to ASTM F656.
4. PVC to ABS Piping Transition: ASTM D3138.

H. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.2 DIELECTRIC FITTINGS

A. Dielectric Fittings, General: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

B. Dielectric Unions:

1. Description: Factory fabricated, union, NPS 2 and smaller:

a. Pressure Rating: 250 psig at 180 deg F.
b. End Connections: Solder-joint copper alloy and threaded ferrous; threaded ferrous.

C. Dielectric Flanges:

1. Description Factory-fabricated, bolted, companion-flange assembly, NPS 2-1/2 to NPS 4 and larger:

a. Pressure Rating: 300 psig.
b. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric Couplings:

1. Description Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining, NPS 3 and smaller:

a. Pressure Rating: 300 psig at 225 deg F.
b. End Connections: Threaded.

E. Dielectric Nipples:

1. Description: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining.

a. Pressure Rating: 300 psig at 225 deg F.
b. End Connections: Threaded or grooved.

2.3 SLEEVES

A. Mechanical sleeve seals for pipe penetrations are specified in Section 220500 "Common Work Results for Plumbing."

B. Galvanized-Steel Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

C. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, galvanized, plain ends.

D. Cast-Iron Sleeves: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

E. Molded PVC Sleeves: Permanent, with nailing flange for attaching to wooden forms.

F. PVC Pipe Sleeves: ASTM D1785, Schedule 40.

G. Molded PE Sleeves: Reusable, PE, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

2.4 IDENTIFICATION DEVICES

A. Equipment Nameplates: Metal permanently fastened to equipment with data engraved or stamped.

1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested

compliances, and essential data.
2. Location: Accessible and visible.

B. Snap-on Plastic Pipe Markers: Manufacturer's standard preprinted, semirigid, snap-on type. Include color-coding according to ASME A13.1, unless otherwise indicated.

C. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, color-coded, pressure-sensitive-vinyl type with permanent adhesive.

D. Pipes with OD, including Insulation, Less than 6 inches:

1. Full-band pipe markers, extending 360 degrees around pipe at each location.

E. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers, extending 360 degrees around pipe at each location.

F. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers, at least three times letter height and of length required for label.

G. Pipes with OD, including Insultation, 6 inches and Larger:

1. Either full-band or strip-type pipe markers, at least three times letter height and of length required for label.

H. Lettering:

1. Use piping system terms indicated and abbreviate only as necessary for each application length.

a. Arrows: Either integrally with piping system service lettering to accommodate both directions of flow, or as separate unit on each pipe marker to indicate direction of flow.

I. Plastic Tape: Manufacturer's standard color-coded, pressure-sensitive, self-adhesive vinyl tape, at least 3 mils thick.

1. Width: 1-1/2 inches on pipes with OD, including insulation, less than 6 inches; 2-1/2 inches for larger pipes.
2. Color: Comply with ASME A13.1, unless otherwise indicated.

J. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch sequenced numbers. Include 5/32-inch hole for fastener.

1. Material:

a. 0.032-inch-thick, aluminum.
b. 0.0375-inch-thick stainless steel.
c. 3/32-inch-thick plastic laminate with 2 black surfaces and a white inner layer.
d. Valve manufacturer's standard solid plastic.

2. Size: 1-1/2 inches in diameter, unless otherwise indicated.
3. Shape: As indicated for each piping system.

K. Valve Tag Fasteners: Brass, wire-link or beaded chain; or brass S-hooks.

L. Engraved Plastic-Laminate Signs: ASTM D709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.

1. Engraving: Engraver's standard letter style, of sizes and with terms to match equipment identification.
2. Thickness:

    a. 1/8 inch unless otherwise indicated.
    b. 1/16 inch for units up to 20 sq. in. or 8 inches in length, and 1/8 inch for larger units.

3. Fasteners: Self-tapping, stainless steel screws or contact-type permanent adhesive.

M. Plastic Equipment Markers: Manufacturer's standard laminated plastic, in the following color codes:

1. Green: Cooling equipment and components.
2. Yellow: Heating equipment and components.
3. Brown: Energy reclamation equipment and components.
4. Blue: Equipment and components that do not meet criteria above.
5. Hazardous Equipment: Use colors and designs recommended by ASME A13.1.
6. Terminology: Match schedules as closely as possible. Include the following:

    a. Name and plan number.
    b. Equipment service.
    c. Design capacity.
    d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.

7. Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.

2.5 GROUT

A. Description: ASTM C1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post hardening, volume adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.6 CLEANOUTS

A. Cast-Iron Cleanouts for Main Lines:

1. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
2. Top-Loading Classification(s): Heavy Duty and Extra-Heavy Duty.
3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

B. Cast-Iron Cleanouts for RV Stalls:

1. Description: 4” RV Female Footloose Sewer Cap (White), Enviro Design Products or equal. Submit shop drawing.
2. Sewer Pipe Fitting and Riser to Cleanout: Schedule 40 PVC

PART 3 - EXECUTION

3.1 DIELECTRIC FITTING APPLICATIONS

A. Dry Piping Systems: Connect piping of dissimilar metals with the following:

1. NPS 2 (DN 50) and Smaller: Dielectric unions.
2. NPS 2-1/2 to NPS 12 (DN 65 to DN 300): Dielectric flanges or dielectric flange kits.

B. Wet Piping Systems: Connect piping of dissimilar metals with the following:

1. NPS 2 (DN 50) and Smaller: Dielectric couplings or dielectric nipples.
2. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Dielectric nipples.

3.2 INSTALLATION OF PIPING

A. Install piping according to the following requirements and utilities Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on the Coordination Drawings.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping to permit valve servicing.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Select system components with pressure rating equal to or greater than system operating pressure.

I. Sleeves are not required for core-drilled holes.

J. Permanent sleeves are not required for holes formed by removable PE sleeves.

K. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of equipment areas or other wet areas 2 inches above finished floor level.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.

a. Pipe Sleeves: PVC. For pipes smaller than NPS 6.
b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.

L. Verify final equipment locations for roughing-in.

M. Refer to equipment specifications in other Sections for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and utilities Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

E. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

G. Grooved Joints: Assemble joints with grooved-end pipe coupling with coupling

housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

H. Soldered Joints: Apply ASTM B813 water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B828 or CDA's "Copper Tube Handbook," using lead-free solder alloy (0.20 percent maximum lead content) complying with ASTM B32.

I. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

J. Pressure-Sealed Joints: Assemble joints for plain-end copper tube and mechanical pressure seal fitting with proprietary crimping tool to according to fitting manufacturer's written instructions.

K. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D2235 and ASTM D2661 appendixes.
3. CPVC Piping: Join according to ASTM D2846/D2846M Appendix.
4. PVC Pressure Piping: Join schedule number ASTM D1785, PVC pipe and PVC socket fittings according to ASTM D2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D2855.
5. PVC Nonpressure Piping: Join according to ASTM D2855.
6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D3138Appendix.

L. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D3139.

M. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D3212.

N. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D2657.

1. Plain-End PE Pipe and Fittings: Use butt fusion.
2. Plain-End PE Pipe and Socket Fittings: Use socket fusion.

O. Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.4 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Install dielectric fittings at connections of dissimilar metal pipes.

3.5 INSTALLATION OF EQUIPMENT

A. Install equipment level and plumb, unless otherwise indicated.

B. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference with other installations. Extend grease fittings to an accessible location.

C. Install equipment to allow right of way to piping systems installed at required slope.

3.6 IDENTIFICATION

A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.

1. Stenciled Markers: According to ASME A13.1.
2. Plastic markers, with application systems. Install on insulation segment if required for hot noninsulated piping.
3. Locate pipe markers on exposed piping according to the following:

    a. Near each valve and control device.
    b. Near each branch, excluding short takeoffs for equipment and terminal units. Mark each pipe at branch if flow pattern is not obvious.
    c. Near locations where pipes pass through walls or floors or enter inaccessible enclosures.
    d. At manholes and similar access points that permit view of concealed piping.
    e. Near major equipment items and other points of origination and termination.

B. Equipment: Install engraved plastic-laminate sign or equipment marker on or near each major item of equipment.

1. Lettering Size: Minimum 1/4 inch high for name of unit if viewing distance is less than 24 inches, 1/2 inch high for distances up to 72 inches , and proportionately larger lettering for greater distances. Provide secondary lettering two-thirds to three-fourths of size of principal lettering.
2. Text of Signs: Provide name of identified unit. Include text to distinguish among multiple units, inform user of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

C. Adjusting: Relocate identifying devices that become visually blocked by work of this or other Divisions.

3.7 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.

2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Section 033000 "Cast-in-Place Concrete."

3.8 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Section 055000 "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor piped utility materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.9 GROUTING

A. Mix and install grout for equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

3.10 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and use cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic

areas.

3. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
4. Use Extra-Heavy-Duty, top-loading classification cleanouts in roads.

B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

END OF SECTION

SECTION 330513

MANHOLES AND STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Modular precast concrete manhole and structures with tongue-and-groove joints, cover frame, covers, anchorage, and accessories. For junction box and inlet structure, and detention basin.
2. Bedding and cover materials.

B. Related Sections:

1. Section 32 0523 - Concrete for Exterior Improvements: Concrete for manhole and structure base pad construction.

1.2 REFERENCES

A. American Concrete Institute:

1. ACI 318 - Building Code Requirements for Structural Concrete.
2. ACI 530/530.1 - Building Code Requirements for Masonry Structures and Specifications for Masonry Structures.

B. ASTM International:

1. ASTM A48/A48M - Standard Specification for Gray Iron Castings.
2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. ASTM A536 - Standard Specification for Ductile Iron Castings.
4. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
5. ASTM C55 - Standard Specification for Concrete Brick.
6. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale).
7. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections.
8. ASTM C497 - Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.
9. ASTM C913 - Standard Specification for Precast Concrete Water and Wastewater Structures.
10. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.
11. ASTM D3753 - Standard Specification for Glass-Fiber-Reinforced Polyester

1.3 DESIGN REQUIREMENTS

A. Equivalent strength: Based on structural design of reinforced concrete as outlined in ACI 318.

B. Design of Lifting Devices for Precast Components: In accordance with ASTM C913.

C. Design of Joints for Precast Components: In accordance with ASTM C913; maximum leakage of 0.025 gallons per hour per foot of joint at 3 feet of head.

1.4 SUBMITTALS

A. Shop Drawings: Indicate manhole and structure locations, elevations, piping, and sizes and elevations of penetrations.

B. Product Data: Submit cover and frame construction, features, configuration, and dimensions.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with the City of Wynne's applicable standards requirements and the Arkansas Department of Transportation (ARDOT) Standard Specifications.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years of experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with precast concrete manufacturer’s instructions for unloading, storing and moving precast manholes and structures.

B. Store precast concrete manholes and structures to prevent damage to Owner’s property or other public or private property. Repair property damaged from materials storage.

C. Mark each precast structure by indentation or waterproof paint showing date of manufacture, manufacturer, and identifying symbols and numbers shown on Drawings to indicate its intended use.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Cold Weather Requirements: ACI 530.

PART 2 - PRODUCTS

2.1 MANHOLES AND STRUCTURES

A. Manufactures

1. Precast Manhole square manhole.

a. Hanson Pipe and Products, Inc, 48-inch square manhole or equal.

B. Manhole and Structure Sections: Reinforced precast concrete in accordance with ASTM C478 with gaskets in accordance with ASTM C923 or cast-in-place (submit shop drawings for cast-in-place reinforcement and dimensions) .

C. Mortar and Grout: As specified in Section 040511, Masonry Mortar and Grout. Type S.

D. Reinforcement: As specified in Section 320523, Concrete for Exterior Improvements.

2.2 FRAMES AND COVERS

A. Refer to Drawings for frame, grates, and covers required for each manhole and structure.

B. Product Description: Cast iron construction, machined flat bearing surface and as shown on the Drawings.

2.3 COMPONENTS

A. Manhole Steps: corrosion resistant, coated, and reinforced with steel per ASTM C-478. Steel reinforcing minimum 1/2" diameter. Formed integral with manhole and structure sections.

2.4 CONFIGURATION

A. Shaft Constructions: As indicated on the Drawings, lipped male/female joints; sleeved to receive pipe sections.

B. Shape: As indicated on the Drawings.

C. Clear Inside Dimensions: As indicated on the Drawings.

D. Design Depth: As indicated on Drawings.

E. Clear Cover Opening: As indicated on Drawings.

F. Pipe Entry: Furnish openings as indicated on Drawings.

G. Steps: As required by code.

2.5 BEDDING AND COVER MATERIALS

A. Refer to Section 312116, Trenching.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify items provided by other sections of Work are properly sized and located.

B. Verify built-in items are in proper location, and ready for roughing into Work.

C. Verify correct size of manhole and structure excavation.

3.2 PREPARATION

A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

B. Do not install structures where site conditions induce loads exceeding structural capacity of structures.

C. Inspect precast concrete structures immediately prior to placement in excavation to verify structures are internally clean and free from damage. Remove and replace damaged units.

3.3 INSTALLATION

A. Excavation and Backfill:

1. Excavate for manholes and structures in accordance with Section 312000 in location and to depth shown. Provide clearance around sidewalls of structure for construction operations.
2. When groundwater is encountered, prevent accumulation of water in excavations. Place manholes and structures in dry trench.
3. Where possibility exists of watertight structure becoming buoyant in flooded excavation, anchor structure to avoid flotation.

B. Place base pad, trowel top surface level.

C. Place manhole and structure sections plumb and level, trim to correct elevations, anchor to base pad.

D. Backfill excavations for manholes and structures in accordance with Section 312000.

E. Form and place manhole and structures cylinder plumb and level, to correct dimensions and elevations.

F. Cut and fit for pipe sections.

G. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour to form continuous drainage channel as indicated on Drawings.

H. Set cover frames and covers level without tipping, to correct elevations.

I. Coordinate with other sections of Work to provide correct size, shape, and location.

3.4 PRECAST CONCRETE MANHOLE AND STRUCTURE INSTALLATION

A. Lift precast components at lifting points designated by manufacturer.

B. When lowering manholes and structures into excavations and joining pipe to units, take precautions to ensure interior of pipeline and structure remains clean.

C. Set precast structures bearing firmly and fully on crushed stone bedding, compacted in accordance with provisions of Section 312000 and 312116 or on other support system shown on Drawings.

D. Assemble multi-section structures by lowering each section into excavation. Lower, set level, and firmly position base section before placing additional sections.

E. Remove foreign materials from joint surfaces and verify sealing materials are placed properly. Maintain alignment between sections by using guide devices affixed to lower section.

F. Joint sealing materials may be installed on site or at manufacturer's plant.

G. Verify manholes and structures installed satisfy required alignment and grade.

H. Remove knockouts or cut structure to receive piping without creating openings larger than required to receive pipe. Fill annular space with mortar.

I. Cut pipe to finish flush with interior of structure.

J. Shape inverts through manhole and structures as shown on Drawings.

3.5 FRAME AND COVER INSTALLATION

A. Set frames using mortar and pre-cast concrete rings. Install precast reinforced concrete rings. Lay precast concrete rings in full bed of mortar and completely fill joints.

3.6 FIELD QUALITY CONTROL

A. Test cast-in-place concrete in accordance with Section 32 0523 Concrete for Exterior Improvements.

B. Vertical Adjustment of Existing Manholes and Structures:

1. Where required, adjust top elevation of existing manholes and structures to finished grades shown on Drawings.
2. Reset existing frames, grates and covers, carefully removed, cleaned of mortar fragments, to required elevation in accordance with requirements specified for installation of castings.
3. Remove concrete without damaging existing vertical reinforcing bars when removal of existing concrete wall is required. Clean vertical bars of concrete and bend into new concrete top slab or splice to required vertical reinforcement, as indicated Drawings.
4. Clean and apply sand-cement bonding compound on existing concrete surfaces to receive cast-in-place concrete in accordance with Section 32 0523.

END OF SECTION

SECTION 334111

STORM DRAINAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Storm drainage piping.
2. Accessories.
3. Underground pipe markers.

B. Related Sections:

1. Section 31 2000 – Earthwork: Backfill and compaction for structures and storm piping.
2. Section 31 2116 - Trenching: Execution requirements for trenching required by this section.
3. Section 32 0523 - Concrete for Exterior Improvements: Concrete type for catch basin base pad construction.
4. Section 33 0513 - Manholes and Structures.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:

1. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
2. ASTM C14 - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.
3. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
4. ASTM C443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
5. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
6. ASTM C924 - Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.
7. ASTM C969 - Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
8. ASTM C1103 - Standard Practice for Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
9. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
10. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).

11. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
12. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
13. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
14. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
15. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
16. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
17. ASTM D6938 - 10 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
18. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
19. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

1.3 SUBMITTALS

A. Product Data: Submit data indicating pipe, pipe accessories, and appurtenances.

B. Manufacturer's Installation Instructions: Submit special procedures required to install Products specified.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents:

1. Accurately record actual locations of pipe runs, connections, catch basins, structures, and invert elevations.
2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with the City of Wynne’s applicable standards requirements.

1.6 COORDINATION

A. Coordinate the Work with termination of storm sewer connection outside building, trenching, and to the connection to municipal storm sewer utility service.

PART 2 - PRODUCTS

2.1 STORM DRAINAGE PIPING

A. Polyethylene Pipe:

1. Piping and fittings shall be ADS N-12 ST IB pipe as manufactured by Advanced Drainage Systems (ADS) of Hilliard, OH, or equal.

2. Piping and fittings shall have a smooth interior and annular exterior corrugations.
3. Pipe shall be manufactured in accordance with AASHTO M252, Type S or SP for 4-inch through 10-inch diameter, and AASHTO M294 or ASTM F2306 for 12-inch through 60-inch diameter.
4. Pipe shall be joined using a bell and spigot joint meeting AASHTO M252, AASHTO M294 or ASTM F2306. The joint shall be soil-tight and gaskets shall meet the requirements of ASTM F477.
5. Fittings shall conform to AASHTO M252, AASHTO M294, or ASTM F2306. Bell and spigot connections shall utilize a spun-on or welded bell and valley or saddle gasket meeting the soil-tight joint performance requirements of AASHTO M252, AASHTO M294 or ASTM F2306.
6. Virgin material for pipe and fitting production shall be high density polyethylene conforming with the minimum requirements of cell classification 424420C for 4- through 10-inch diameters, or 435400C for 12- through 60-inch diameters, as defined and described in the latest version of ASTM D3350, except that carbon black content should not exceed 4%. The 12- through 60-inch virgin pipe material shall comply with the notched constant ligament-stress (NCLS) test as specified in Sections 9.5 and 5.1 of AASHTO M294 and ASTM F2306, respectively.

B. Perforated Pipe for Underdrains:

1. Piping and fittings shall be perforated ADS single wall corrugated HDPE pipe as manufactured by Advanced Drainage Systems (ADS) of Hilliard, OH, or equal.
2. Perforations shall be Type B pattern as specified by ADS. Contractor shall obtain approval if perforation pattern other than Type B is to be used.
3. Perforated pipe shall be wrapped in geotextile fabric. Fabric shall be 4-oz non-woven geotextile fabric, Mirafi 140N or equivalent.

C. Reinforced Concrete Pipe:

1. Reinforced concrete pipe and flared-end sections: ASTM C 76, Type III, tongue and groove joints.
2. Joint material: cold-applied preformed plastic gasket type sealant conforming to ASTM C 443.

2.2 ACCESSORIES

A. Filter Fabric: Non-biodegradable, non-woven, 6 oz minimum weight.

B. Grout: Specified in Section 320523.

2.3 UNDERGROUND PIPE MARKERS

A. Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with "Storm Sewer Service" in large letters.

2.4 CATCH BASINS

A. Refer to Section 33 0513 Manholes and Structures and as indicated on the Drawings.

2.5 BEDDING AND COVER MATERIALS

A. Bedding: As indicated on the Drawings.

B. Cover: As indicated on the Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify excavation base is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with fine aggregate.

B. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

3.3 BEDDING

A. Excavate pipe trench in accordance with Section 312116 for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.

B. Place bedding material at trench bottom, level materials in continuous layer not exceeding 8 inches compacted depth.

C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with ASTM D2321. Seal joints watertight.

B. Place pipe on bedding material as indicated on the Drawings.

C. Lay pipe to slope gradients noted on drawings with maximum variation from indicated slope of 1/8 inch in 10 feet.

D. Place bedding backfill around pipe as indicated on the Drawings.

E. Install trace wire continuous over top of pipe buried 12 inches below finish grade, above pipe line.

F. Install site storm drainage system piping to 5 feet of building. Connect to building storm drainage system.

3.5 INSTALLATION - CATCH BASINS AND STRUCTURES

A. Perform work in accordance with Drawings.

B. Refer to Section 330513, Manholes and Structures.

3.6 FIELD QUALITY CONTROL

A. Request inspection prior to and immediately after placing aggregate cover over pipe.

3.7 PROTECTION OF FINISHED WORK

A. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

1. Take care not to damage or displace installed pipe and joints during construction of pipe supports, backfilling, testing, and other operations.
2. Repair or replace pipe that is damaged or displaced from construction operations.

END OF SECTION