

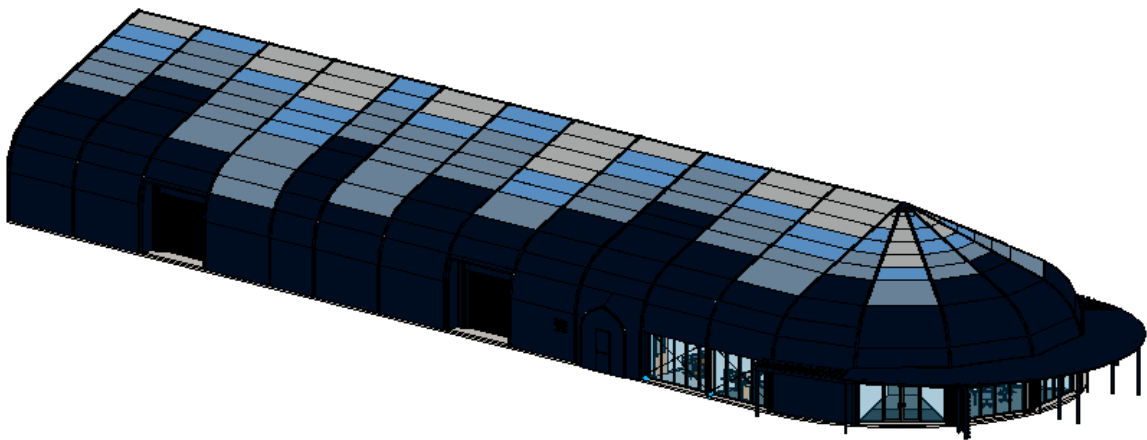
CITY OF ROGERS, ARKANSAS:

BUILDING FOR ROGERS FACILITIES DEPARTMENT

2295 N. ARKANSAS ST.
ROGERS, AR 72756

COMM. NO. 62425

MAY 8, 2026 – FINAL BID SPECS



DEMIX
ARCHITECTURE

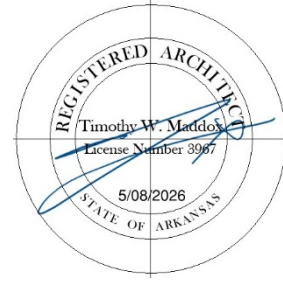
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BUILDING FOR ROGERS FACILITIES DEPARTMENT
ROGERS, AR

SECTION 00 01 07
SEALS

Architectural

DEMX architecture
104 N. East Avenue
Fayetteville, Arkansas 72701
479-966-4871



Civil

OLSSON
3537 N. Steele Blvd, Ste 310
Fayetteville, Arkansas 72703
479-527-0495

**PRELIMINARY (NOT
FOR CONSTRUCTION)**

Structural

MARTIN/MARTIN
908 S. Walton Blvd, Ste 39
Bentonville, Arkansas 72712
479-407-0945



Mechanical, Plumbing

PRIGM
310 W. Dickson St., Ste 210
Fayetteville, Arkansas 72701
479-407-0945



Electrical

PRIGM
310 W. Dickson St., Ste 210
Fayetteville, Arkansas 72701
479-407-0945



DEMX ARCHITECTURE
FAYETTEVILLE, AR

SEALS
00 01 07-1

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BUILDING FOR ROGERS FACILITIES DEPARTMENT
ROGERS, AR

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BUILDING FOR ROGERS FACILITIES DEPARTMENT
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BIDDING STATEMENT

REFER TO THE CM MANUAL PREPARED BY MILESTONE CONSTRUCTION, FOR BIDDING INFORMATION.

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ROGERS, AR

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DEMX ARCHITECTURE
FAYETTEVILLE, AR

DOCUMENT 00 21 13
INSTRUCTIONS TO BIDDERS

1.01 BIDDING DOCUMENTS.

- A. Bidders may obtain complete sets of Contract Documents from Milestone Construction. Complete sets of Contract Documents must be used in preparing bids; neither Owner nor Design Professional assume responsibility for errors or misinterpretations resulting from the use of incomplete sets of Contract Documents. Obtaining Contract documents through any source other than the Milestone Construction. is not advisable due to the risks of receiving incomplete or inaccurate information, and the bidder runs the risk of basing bidder's proposal on such information. The fact that documents used for bidding purposes are named "contract documents" does not diminish in any way the right of the Owner to reject any and all bids and to waive any formality.

1.02 EXAMINATION OF DRAWINGS, SPECIFICATIONS AND SITE OF WORK.

- A. Bidder shall examine the Contract Documents and visit the project site of work. Bidder shall become familiar with all existing conditions and limitations under which the Work is to be performed and shall base bid on items necessary to perform the Work as set forth in the Contract Documents. No allowance will be made to Bidder because of lack of such examination or knowledge. The submission of a Bid shall be construed as conclusive evidence that the Bidder has made such examination.

1.03 INTERPRETATION OF CONTRACT DOCUMENTS DURING BIDDING.

- A. All references to the Owner shall be interpreted to mean City of Rogers
- B. If any person contemplating submitting a Bid is in doubt as to the true meaning of any part of the Contract Documents or finds discrepancies in or omissions from any part of the Contract Documents, he may submit to DEMX Architecture, a written request for an interpretation or correction thereof not later than five (5) calendar days before Bid opening.
- C. Address all communications regarding the Contract Documents to the Design Professional: DEMX Architecture, 104 N. East Ave., Fayetteville, AR 72701.
- D. Interpretation or correction of the Contract Documents will be made only by Addendum. Any addenda to the plans and/or specifications issued before or during the time of bidding will become a part of the Contract and receipt of same must be acknowledged by Bidder in his proposal.

1.04 SUBSTITUTIONS

- A. Materials, products, and equipment described in the Contract Documents establish a standard of required function and a minimum desired quality or performance level, or other minimum dimensions and capacities, to be met by any proposed substitution
- B. In some cases, prior approval of material or equipment, or both shall be obtained from the Architect in order to obtain the desired color, size, visual appearance, and other features specified.

1.05 TYPE OF BID

- A. Bids are to include all labor, materials, equipment, sales tax, social security tax, State Unemployment Insurance, and all other like items necessary to complete this project.
- B. Any estimate of quantities is approximate only and shall be the basis for receiving unit price bids for each item but shall not be considered by the Bidder as the actual quantities that may be required for the completion of the proposed work.

1.06 SUBCONTRACTORS

- A. Electrical License Requirement
 - 1. No person shall perform electrical work on the contract without possessing an Arkansas State Master or Journeyman License from the Arkansas State Electrical Examiners Board. A Master or Journeyman Electrician shall supervise all electrical work and apprentice electricians on a one-to-one ratio.
 - 2. All electricians shall have a copy of their license with them and shall be required to show it to an appropriate inspector upon request.
- B. Pursuant to Ark. Code Ann. § 22-9- 404, the Bidder may require listed subcontractors (mechanical, plumbing, electrical and roofing/sheet metal) whose bid to the Contractor exceeds \$50,000.00 to provide a Performance and Payment Bond to the Bidder.

1.07 MODIFICATION AND WITHDRAWAL

- A. Bidder may withdraw bid at any time before bid opening and may resubmit up to the date and time designated for receipt of bids. No bid may be withdrawn or modified after time has been called for the bid opening. Oral modifications to bids will not be considered. Bidder may submit written modifications to bid in writing, by telegraph, or by facsimile at any time prior to the expiration of the bidding time and date and shall so word the modification(s) as to not reveal the amount of the original bid. Telegraph or facsimile modifications shall require written confirmation over the Bidder's signature within 24 hours after bid opening.

1.08 DISQUALIFICATION OF BIDDERS

- A. The Owner shall have the right to disqualify bids (before or after opening), which includes but is not limited to, evidence of collusion with intent to defraud or other illegal practices upon the part of the Bidder, to reject a bid not accompanied by the required bid security or by other data required by the Contract Documents, or to reject a Bid which is in any way incomplete or irregular.

1.09 APPLICABLE LAWS

- A. Labor. Contractors employed upon the work will be required to conform to the labor laws of the State of Arkansas and the various acts amendatory and supplementary thereto, and to all the laws, regulations, and legal requirements applicable thereto.
- B. Discrimination. Bidder shall not discriminate against any employee, applicant for employment, or subcontractor as provided by law. Bidder shall be responsible for ensuring that all subcontractors comply with federal and state laws and regulations related to discrimination. Upon a final determination by a court or administrative body having proper jurisdiction that the Bidder has

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violated state or federal laws or regulations, the Owner may impose a range for appropriate remedies up to and including termination of the Contract.

- C. Taxes. Bidder shall include in the bid all state sales tax, social security taxes, state unemployment insurance, and all other items of like nature. It is the intent that the bid shall represent the total cost to the Owner of all work included in the contract. There are no provisions for a contractor to avoid taxes by using the tax-exempt number of a state agency, board, commission or institutions. Said taxes shall be included in the bid price.
- D. State licensing laws for Contractors.
- E. Minority Participation: Pursuant to Ark. Code Ann. § 22-9-203, the Owner and the State of Arkansas encourage all small, minority, and women business enterprises to submit bids for capital improvements. Encouragement is also made to all general contractors that in the event they subcontract portions of their work, consideration is given to the identified groups.
- F. The bidding, award and administration of the contract shall be made pursuant to Ark. Code Ann. §14-4-1401 et seq., Ark. Code Ann. § 22-9-101 et seq., and Ark. Code Ann. § 22-2-101 et seq.

1.10 EVALUATION and CONSIDERATION OF BIDS

- A. It is the intent of the Owner to award a Contract to the lowest responsive qualified bidder provided the bid has been submitted in accordance with the requirements of the Contract Documents and does not exceed the funds certified for the project by more than 25%. The Owner shall have the right to waive any formalities in a bid received and to accept the bid which, in the Owner's judgment, is in its best interests. The Owner shall have the right to accept any or all bids for a period not to exceed thirty (30) days.

1.11 EXECUTION OF CONTRACT

- A. The apparent low Bidder shall be prepared, if so required by the Owner, to present evidence of experience, qualifications, and financial ability to carry out the terms of the Contract. Attention is called to the fact that the bidder in signing the proposal, represents that he has the financial ability and experience to carry out the work throughout its several stages within the time for completion set forth on the Bid Form.
- B. The successful Bidder will be required to execute an Agreement with the Owner on a form identical to the Agreement Form included with the Contract Documents and the Performance and Payment Bond and Certification of Insurance within ten days after receipt of the Intent to Award. Failure of the Bidder to do so may result in the Bidder being rejected and could result in disqualification and forfeiture of bid bond.
- C. The successful Bidder will be required to furnish Owner with proof of insurance, as prescribed by the General Conditions and Supplementary General Conditions.

END OF DOCUMENT 00 21 13

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BUILDING FOR ROGERS FACILITIES DEPARTMENT
ROGERS, AR

DOCUMENT 00 31 32
GEOTECHNICAL INFORMATION AVAILABL TO BIDDERS

PART 1 – GENERAL

1.01 PURPOSE

This section identifies information that was gathered solely for the use of the Designer, is not a Bidding Document, but is available for review by Bidders. Bidders have the entire responsibility for their interpretation and use of this information and shall not rely on the information for preparation of a bid.

1.02 SUB-SURFACE INVESTIGATION AND REPORT

- A. A sub-surface investigation has been performed at the project site.
- B. The Owner is not responsible for variations in the sub-surface conditions. Bidders shall decide for themselves the character of the material to be encountered.
- C. The report of the findings of this investigation is on file in the Geotech Engineer's office and may be reviewed there by any prospective Bidder of Record. Bidders should call ahead to schedule an appointment. A copy will be provided to any Bidder of Record upon request.

Geotechnical Engineer – Olsson Engineering
3537 N. Steele Blvd, Ste 310
Fayetteville, Arkansas 72703
479-527-0495

GEOTECHNICAL ENGINEERING REPORT
Rogers Recycling Center
Rogers, Arkansas
01/21/2026
Olsson Project No. 025-04961
Arkansas Certificate of Authorization # 1010

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF DOCUMENT 00 31 32

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SECTION 00 73 19 - OSHA REGULATIONS (STANDARDS – 29 CFR)

PART 1926 SUBPART P - EXCAVATIONS:

Provided below are web site links where you may access OSHA Regulations. If you cannot access these links, you may review a copy of these regulations at the office of MAHG Architecture, Inc., 6400 Riley Park Dr., Fort Smith, AR 72916, (479) 782-1051.

1926.650 - Scope, Application, and Definitions applicable to this support

http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10774

1926.651 - Specific Excavation Requirements

http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10775

1926.652 Requirements for Protective Systems

http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10776

1926 Subpart P App A - Soil Classification

http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10931

1926 Subpart P App B - Sloping and Benching

http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10932

1926 Subpart P App C - Timber Shoring for Trenches

http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10933

1926 Subpart P App D - Aluminum Hydraulic Shoring for Trenches

http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10934

1926 Subpart P App E - Alternatives to Timber Shoring

http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10935

1926 Subpart P App F - Selection of Protective Systems

http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10936

END OF SECTION

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ROGERS, AR

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SECTION 01 00 00
GENERAL REQUIREMENTS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 PROJECT LIMITS

- A. Contractor shall confine his operations to the areas required for construction. Contractor shall erect a 6' high construction fence with metal post to protect his materials and to provide security for the public.
- B. Do not close or obstruct streets or walks without permission from authorities having jurisdiction.
- C. Upon completion of the Work, Contractor shall restore to their original conditions, any areas that have been disturbed during construction.

1.03 UTILITIES

- A. Locations of electric, gas, water, sanitary sewer lines are indicated on the Drawings in accordance with such information as is now available.

1.04 TOILET FACILITIES

- A. The Contractor will provide and maintain temporary toilet facilities for use by workmen, properly secluded from public observation.

1.05 UTILITIES FOR CONSTRUCTION PURPOSES

- A. The Contractor shall furnish and install water lines from the available or accessible source of supply, and the Contractor shall pay for all water used for building purposes.
- B. The Contractor will make all necessary applications, pay all fees and charges, to provide and maintain temporary energy for power and light as required for surfacing machines, hoist, other electrical tools and equipment and as necessary for providing and maintaining artificial light in the progress of all branches of the work during the course of construction. The Contractor shall pay for all electricity used. Each subcontractor shall furnish and install all temporary power cords needed for their execution of work and shall closely coordinate their needs through the Contractor.

1.06 TEMPORARY HEAT

- A. The existing building and additions must be kept dry and warm at times when by being cold or wet it will suffer injury before completion. At all times after the building is enclosed temperature inside shall be maintained at not less than 45 F, not less than 15 F warmer than outside air when outside temperature is between 30 F and 40 F.

BUILDING FOR ROGERS FACILITIES DEPARTMENT
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- B. Blower type heaters and liquid fuel may be used before the building additions are enclosed but the equipment must be in first class operating condition and produce smokeless and odorless heat.
- C. After the building is enclosed, install such temporary piping and heating units as are required to heat with gas. Gas burning equipment must be vented. Liquid fuel must not be used.

1.07 ENGINEERING AND LAYOUT

- A. Provide competent engineering services to execute Work in accordance with Contract requirements. Verify figures shown on Drawings before undertaking construction work and be responsible for accuracy of finished work.

1.08 MEASUREMENTS

- A. Contractor shall be responsible for accuracy of measurements at the building, and inaccuracies which may be found shall be submitted to the Architect for consideration before proceeding with Work. No extra compensation will be allowed on account of differences between actual dimensions and dimensions shown on the Drawings.

1.10 PERMITS AND REGULATIONS

- A. The Contractor shall obtain and pay for all permits and fees pertaining to the Work.

1.11 COORDINATION OF WORK.

- A. It is not possible to show on a single Drawing, or specify in a single Section, all information pertaining to construction of any one area of the building. Compare all of the Drawings and Specifications and be responsible for coordinating work of various subcontractors and trades, and avoiding interferences between inter- related portions of the Work.
- B. Report to the Architect any inconsistency, interference, error or omission discovered in Contract Documents. Do not proceed with Work without first obtaining instructions or revised Drawings or Specifications from the Architect.
- C. Chases, openings, recesses, sleeves, anchors, and inserts shall be installed in concrete, masonry and partition constructions as work progresses. Cutting or other measures which are necessary because of failure to properly locate or install openings or fastenings shall be done in a manner which will accomplish the desired result without damage to construction or appearance, and in a manner acceptable to the Architect.

1.12 REFERENCED SPECIFICATIONS AND STANDARDS

- A. Materials or operations specified by reference to the published specifications of a manufacturer, trade association, or institute shall conform to that edition of the referenced specification or standard which was in effect on January 1, 1997.
- B. Reference is made by use of abbreviations to specifications and standards of the following:

ACI	American Concrete Institute
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute

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AWS	American Welding Society
ASTM	American Society for Testing Materials
CRSI	Concrete Reinforcing Steel Institute
NFPA	National Fire Protection Association
UL	Underwriter's Laboratories, Inc.

1.13 REMOVALS

- A. Contractor shall remove temporary work when need for its use has passed.
- B. Contractor shall clean spaces that were occupied temporarily and remove debris and rubbish from site.

END OF SECTION

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BUILDING FOR ROGERS FACILITIES DEPARTMENT
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SECTION 01 11 00
SUMMARY OF WORK

PART 1- GENERAL

1.1 WORK UNDER THIS CONTRACT: The project consists of an approximately 12,000 sf tension fabric building, with conditioned interiors consisting of metal framed offices, open staff work area, breakroom, locker space, storage, toilets, and a decked mechanical platform. The remaining interior space will consist of open bays for shop, inventory, and storage space.

1.1.1 All utilities as required for building operation both from inside the building to 5'-0" outside the building, and from 5'-0" outside the building to the appropriate main service line as coordinated with utilities provider or other applicable city officials. This includes tap fees, meters, connections, electrical transformer and pad (as required), and all other Work related to utility provision and installation as required for complete operation.

1.2 OWNER PROVIDED AND INSTALLED ITEMS

- A. Appliances
- B. Various shop tools and systems, provided by and coordinated as noted on equipment schedule.
- C. Various bathroom accessories as noted in toilet accessory schedule
- D. Televisions and Mounts, blocking to be provided by contractor

1.5 COORDINATION

- A. Provide administrative and supervisory requirements necessary for coordination of work, including meetings, administrative and supervisory personnel, records, reports, limitations for use of site, installation provisions, cutting and patching, cleaning, protection, and conservation.
 - 1 Coordinate construction activities included under various sections of these specifications to assure efficient and orderly installation of each part of the work. Coordinate construction operations included under different sections of the specification that are dependent upon each other for proper installation, connection, and operation.
 - a. Where installation of one part of the work is dependent on other installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain its best results.
 - b. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.
 - c. Make adequate provisions to accommodate items scheduled for later installation.
 - 2 Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports and attendance meetings.

1.6 INDUSTRY STANDARDS

- A. Applicability of Standards: Except where more explicit or stringent requirements are written into the contract documents, applicable construction industry standards have the same force and effect as if bound or copied directly into the

contract documents. Such industry standards are made a part of the contract documents by reference. Individual specification sections indicate which codes and Standards the Contractors must keep available at the project site for reference.

- B. Publication Dates: Except as otherwise indicated: where compliance with an industry standard is required, comply with standards in effect as of the date of the contract documents.
- C. Conflicting Requirements: Where compliance with two or more standards is specified, and where these standards establish different or conflicting requirements for minimum quantities or quality levels, the most stringent requirement will be enforced, unless the contract documents specifically indicate otherwise. Refer requirements that are different, but apparently equal, and uncertainties as to which quality level is more stringent to the Construction Manager/ Architect for a decision before proceeding.
- D. Copies of Standards: The Contract Documents require that each entity performing work be experienced in that part of the work being performed. Each entity is also required to be familiar with industry standards applicable to that part of the work. Copies of applicable standards are not bound with the contract documents. Where copies of standards are needed for proper performance of the work, the Contractor is required to obtain such copies directly from the publication source.
- E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where acronyms or abbreviations are used in the specifications or other contract documents, they are defined to mean the recognized name of the trade association, standards generating organization, governing authority, or other entity applicable to the context of the text provisions.

1.7 PROJECT MEETINGS:

- A. Pre-Construction Meeting: Within 15 days after execution of agreement, the Construction Manager will prepare an agenda and schedule a pre-construction meeting. Written notice of meeting date, time and place, and agenda items will be sent to Owner, Architect/ Engineers, and Contractors. The Contractors shall be responsible for notifying subcontractors of meeting.
- B. Progress Meetings: The Construction Manager shall schedule and hold regular monthly progress meetings and subsequent meetings as needed to coordinate, expedite and schedule work of all contracts. Superintendent will hold weekly meetings on Fridays with current contractors working on project and contractors who will begin work within the following two weeks. Send written notice of meeting date, time and place, and agenda of meeting to the Owner, Architect/ Engineers, Contractors, vendors, and others as pertinent to agenda. Record results of meetings and distribute copies to everyone in attendance and to others affected by the decisions or actions resulting from each meeting.

PART 2- PRODUCTS

2.1 Protection of Existing Items:

- A. Existing items which are disturbed, broken, removed or otherwise damaged during the execution of this Contract shall be replaced in accordance with the original design and construction at no additional cost to the Owner; unless those items are indicated to be removed per the Contract Documents.

2.2 Utilities:

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- B. The cost of any required temporary or permanent utility connection, tap fee, and meter shall be paid by the Contactor.

2.3 Special Order Materials:

- C. The Contractor shall be advised that items available on special order basis only shall be secured with the manufacturer in a timely manner so as not to delay Work. Time extensions will not be approved for delays related to product manufacturing, fabrication, nor delivery.

PART 3- EXECUTION (Not Applicable)

END OF SECTION

**BUILDING FOR ROGERS FACILITIES DEPARTMENT
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SECTION 01 25 00
SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUBSTITUTION PROCEDURES

- A. Substitutions include changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- B. Substitution Requests: Submit three copies of each request for consideration. Identify 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 **CSI Form 13.1A**.
 - 2. Submit requests within 15 days after **the Notice to Proceed**.
 - 3. Identify product to be replaced and show compliance with requirements for substitutions. Include a detailed comparison of significant qualities of proposed substitution with those of the Work specified, a list of changes needed to other parts of the Work required to accommodate proposed substitution, and any proposed changes in the Contract Sum or the Contract Time should the substitution be accepted.
- C. Architect will review proposed substitutions and notify Contractor of their acceptance or rejection. If necessary, Architect will request additional information or documentation for evaluation.
 - 1. Architect will notify Contractor of acceptance or rejection of proposed substitution within **15** days of receipt of request, or **7** days of receipt of additional information or documentation, whichever is later.
- D. Do not submit unapproved substitutions on Shop Drawings or other submittals.

1.2 PREAPPROVED SUBSTITUTION PROCEDURES

- A. Pre Approved Substitution Request Submittal: The Architect will consider requests for pre approved substitutions if received earlier than 10 days prior to bid date. Requests received less than 10 days prior to bid date may be rejected at the discretion of the Architect. Products/equipment labeled as requiring pre approval for substitutions will not be allowed to be substituted after the award of contract.
 - 1. Products and equipment requiring Pre Approved Substitutions will be listed under the acceptable manufactures section for each product
 - 2. Submit 3 copies of each request for substitution for consideration. Submit requests in the form.

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3. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers.
4. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate.
 - a. Coordination information, including a list of changes or modifications needed to other parts of the work and to construction performed by the Owner and separate contractors, that will be necessary to accommodate the proposed substitution.
 - b. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements, such as performance, weight, size, durability, and visual effect.
 - c. Product Data, including Drawings and descriptions of products and fabrication and installation procedures.
 - d. Samples, where applicable or requested.
 - e. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
 - f. The Contractor's certification that the proposed substitution conforms to requirements in the Contract Documents in every respect and is appropriate for the applications indicated.
2. Architect's Action: If necessary, the Architect will request additional information or documentation for evaluation within one week of receipt of a request for substitution. The Architect will notify the Contractor of acceptance or rejection of the substitution. If the substitution is accepted as an equal, the approval will be listed on an addendum prior to the bid date that will notify all bidders of the accepted equal.
 - a. Use the product specified if the Architect does not accept the proposed substitute.
3. Substitution Request Form: Use **CSI Form 13.1A**.

PART 2 – PRODUCTS

(Not Used)

PART 3 – EXECUTION

(Not Used)

END OF SECTION

SECTION 01 29 76
PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including **Application for Payment forms with Continuation Sheets, Submittals Schedule, and Contractor's Construction Schedule.**
 - 2. Submit the Schedule of Values to Architect at earliest possible date but no later than **seven calendar** days after Notice To Proceed is issued.
 - 3. Sub schedules: Where the Work is separated into phases requiring separately phased payments, provide sub schedules showing values correlated with each phase of payment.
- B. Format and Content: Use the 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. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - 2. Arrange the Schedule of Values in a 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 Order(s) numbers that affect value.
 - g. Dollar Value.
 - (1) Percentage of the contract Sum to the nearest one-hundredth percent, adjusted to total 100 percent.
 - 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.

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4. Round amounts to nearest whole dollar; total shall equal 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. Include evidence of insurance or bonded warehousing if required.
6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. 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.
8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.3 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement
- C. Payment Application Forms: Use **AIA Document G702 and AIA Document G703 Continuation Sheets** as forms for Applications for Payment.
- D. 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 of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

3. Submit updated Gantt-chart schedule for project.
- E. Transmittal: Submit **2**, two, signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt. 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.
- F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is 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 final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
 5. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
- G. 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. Products list.
 5. Schedule of unit prices.
 6. Submittals Schedule (preliminary if not final).
 7. List of Contractor's staff assignments.
 8. List of Contractor's principal consultants.
 9. Copies of building permits.
 10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 11. Initial progress report.
 12. Reports of preconstruction conference.
 13. Certificates of insurance and insurance policies.
 14. Performance and payment bonds.
 15. Data needed to acquire Owner's insurance.
 16. Initial settlement survey and damage report if required.
- H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

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1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- I. Final Payment Application: Processing Final Pay Request. Ensure that the final pay request is accompanied by the Consent of Surety to Final Payment, and the Contractors Release of Liens as required by Paragraph 9.14.2 of the General Conditions. 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. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 6. AIA Document G707, "Consent of Surety to Final Payment."
 7. Evidence that claims have been settled. Submit form in Division 00 Section 00 64 00 "Release of Claims"
 8. 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**.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 – GENERAL

1.1 PROJECT MANAGEMENT AND COORDINATION

- A. Subcontract List: Submit a written summary identifying individuals or firms proposed for each portion of the Work.
- B. Key Personnel Names: Within **15** days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. List e-mail addresses and telephone numbers.
- C. Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work.
- D. Requests for Information (RFIs): On discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI. Use forms acceptable to Architect and Owner.
- E. Project Web Site: Provide, administer, and use Project Web site for purposes of hosting and managing project communication and documentation until Final Completion.
 - 1. Provide up to five Project Web site user licenses for use of the Owner, Architect, and Architect's consultants.
 - 2. Contractor, subcontractors, and other parties granted access by Contractor to Project Web site shall execute a data licensing agreement in the form of Agreement acceptable to Owner and Architect.
- F. Schedule and conduct progress meetings at Project site at regular intervals. Notify Owner and Architect of meeting dates and times. Require attendance of each subcontractor or other entity concerned with current progress or involved in planning, coordination, or performance of future activities.
 - 1. Record minutes and distribute to everyone concerned, including Owner and Architect.

1.2 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings may be provided by Architect for Contractor's use in preparing submittals.
- B. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 1. Submit schedule and list of submittals to architect for approval within 30 days of date established for commencement of the Work.

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2. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 3. Submit digital copies of each action submittal. Architect will return digital copy.
 4. Submit pdf copies of each informational submittal. Architect will not return copies.
 5. Architect will return submittals, without review received from sources other than Contractor.
- C. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with unique identifier, including project identifier, Specification Section number, and revision identifier.
 3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
- D. Identify options requiring selection by Architect.
- E. Identify deviations from the Contract Documents on submittals.
- F. Contractor's Construction Schedule Submittal Procedure:
1. Submit required submittals in the following format:
 - a. Working electronic copy of schedule file, where indicated.
 - b. PDF electronic file.
 - c. Paper copies as required by Owner for review.
 2. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - a. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
 3. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

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- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections.
 - 1. Post electronic submittals as PDF electronic files directly to Cloud Based Project Management System specifically established for Project.
 - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 - 2. Submit electronic submittals via email as PDF electronic files.
 - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2.2 ACTION SUBMITTALS

- A. Submit digital copies of each submittal unless otherwise indicated. Architect will return digital copies.
- B. Product Data: Mark each copy to show applicable products and options. Include the following:
 - 1. Manufacturer's written recommendations, product specifications, and installation instructions.
 - 2. Wiring diagrams showing factory-installed wiring.
 - 3. Printed performance curves and operational range diagrams.
 - 4. Testing by recognized testing agency.
 - 5. Compliance with specified standards and requirements.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data. Submit on sheets at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 42 inches (762 by 1067 mm). Include the following:
 - 1. Dimensions and identification of products.
 - 2. Fabrication and installation drawings and roughing-in and setting diagrams.
 - 3. Wiring diagrams showing field-installed wiring.
 - 4. Notation of coordination requirements.
 - 5. Notation of dimensions established by field measurement. Samples: Submit Samples for review of kind, color, pattern, and texture and for a comparison of these characteristics between submittal and actual component as delivered and installed. Include name of manufacturer and product name on label.

6. If variation is inherent in material or product, submit at least **three** sets of paired units that show variations.

2.3 INFORMATIONAL SUBMITTALS

- A. Informational Submittals: Submit digital copies of each submittal unless otherwise indicated.
- B. Qualification Data: Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- C. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

2.4 DELEGATED DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit digital copy of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

2.5 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type schedule within **30** days of date established for commencement of the Work.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
- C. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
- D. Contractor is required to submit updated Gantt- Chart schedule with each application for payment in order for application for payment to be processed.

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- E. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and indicate date by which recovery will be accomplished.

PART 3 – EXECUTION

3.1 SUBMITTAL REVIEW

- A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Architect will review each action submittal, make marks to indicate corrections or modifications required, will stamp each submittal with an action stamp, and will mark stamp appropriately to indicate action.
- C. Informational Submittals: Architect will review each submittal and will not return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

3.2 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Updating: At bi-weekly intervals, update schedule to reflect actual construction progress and activities. Issue schedule two days before each regularly scheduled progress meeting.
 - 1. As the Work progresses, indicate Actual Completion percentage for each activity.
- B. Distribute copies of approved schedule to Owner, Architect, subcontractors, testing and inspecting agencies, and parties identified by Contractor with a need-to-know schedule responsibility. When revisions are made, distribute updated schedules to the same parties.

END OF SECTION 013000- ADMINISTRATIVE REQUIREMENTS

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SECTION 01 32 00:
CONSTRUCTION PROGRESS DOCUMENTATION

PART 1: GENERAL

1.01 SECTION INCLUDES

- A. This section includes administrative and procedural requirements for documenting the progress of construction during performance of the work, including the following:
 - 1. Contractor's construction schedule.
 - 2. Photographs of job site conditions.

1.02 SUBMITTALS

- A. Contractor's Construction Schedule: Submit two printed copies of initial schedule, large enough to show entire schedule for entire construction period.
- B. Construction Photographs: Submit electronic files (via e-mail) on a weekly basis to Architect and Owner, and a complete record of all submitted photographs as a Project Record Document. Identify electronic files with dates photographs were taken. Submit images that have the same aspect ratio as the sensor, uncropped.

1.03 QUALITY ASSURANCE

- A. Scheduling Consultant Qualifications: An experienced specialist in scheduling and reporting.
- B. Prescheduling Conference: Conduct conference at project site to review methods and procedures related to the Contractor's Construction Schedule, including, but not limited to, the following:
 - 1. Review software limitations and content and format for reports.
 - 2. Verify availability of qualified personnel needed to develop and update schedule.
 - 3. Discuss constraints, including phasing, work stages and area separations.
 - 4. Review delivery dates for Owner-furnished products.
 - 5. Review schedule for work of Owner's separate contracts.
 - 6. Review time required for review of submittals and resubmittals.
 - 7. Review requirements for tests and inspections by independent testing and inspecting agencies.
 - 8. Review time required for completion and startup procedures.
 - 9. Review and finalize list of construction activities to be included in schedule.
 - 3. Review submittal requirements and procedures.
 - 4. Review procedures for updating schedule.

1.04 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities.
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

PART 2 - PRODUCTS

2.01 SUBMITTALS SCHEDULE

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
 - 1. Coordinate Submittals Schedule with list of subcontractors, the Schedule of Values, and Contractor's Construction Schedule.
 - 2. Initial Submittal: Submit concurrently with preliminary schedule. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the work and those required early because of long lead time for manufacture or fabrication.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Procedures: Comply with procedures contained in AGC's "Construction Planning and Scheduling."
- B. Time Frame: Extend schedule from date established for commencement of the work to date of Final Completion.
- C. Activities: Treat each separate area or phase as a separate activity for each principal element of the work. Comply with the following:
 - 1. Activity Duration: In general, define activities so no activity is longer than 20 days.
 - 2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - 3. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.

4. Startup and Testing Time: Include not less than seven days for startup and testing.
 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's and Construction Manager's administrative procedures necessary for certification of Substantial Completion.
- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
 2. Work Under More Than One Contract: Include a separate activity for each contract.
 3. Owner-Furnished Products: Include a separate activity for each product with delivery date. Delivery dates indicated stipulate the earliest possible delivery date.
 4. Work Restrictions: Show the effect of the following items on the schedule:
 - a) Limitations of continued occupancies.
 - b) Uninterruptible services.
 - d) Seasonal variations.
 - e) Environmental control.
 - f) Coordination with existing construction.
 5. Work Stages: Indicate important stages of construction for each major portion of the work, including, but not limited to, the following:
 - a) Subcontract awards.
 - b) Submittals.
 - c) Purchases.
 - d) Mockups.
 - e) Fabrication.
 - f) Sample testing.
 - g) Deliveries.
 - h) Installation.
 - i) Tests and inspections.
 - j) Adjusting.
 - k) Curing.
 - l) Startup and placement into final use and operation.
 6. Area Separations: Identify each major area of construction for each major portion of the work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a) Structural completion.
 - b) Permanent space enclosure.
 - c) Completion of mechanical installation.
 - d) Completion of electrical installation.
 - e) Substantial Completion.
- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.

- F. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis to demonstrate the effect of the proposed change on the overall project schedule.
- G. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules.

2.03 PRELIMINARY CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within seven days of date established for commencement of the work.
- B. Preparation: Indicate each significant construction activity separately. Identify first work-day of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the work and a cash requirement prediction based on indicated activities.

2.04 CONTRACTOR'S CONSTRUCTION SCHEDULE (HORIZONTAL BAR CHART)

- A. Horizontal Bar-Chart Schedule: Submit a comprehensive, fully developed, horizontal bar-chart-type, Contractor's Construction Schedule within 30 days of date established for commencement of the work. Base schedule on the Preliminary Construction Schedule and whatever updating and feedback was received since the start of project.
- B. Preparation: Indicate each significant construction activity separately. Identify first work-day of each week with a continuous vertical line.
 - 1. For construction activities that require 3 months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

PART 3 - EXECUTION

3.01 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the work progresses, indicate Actual Completion percentage for each activity.

- B. Distribution: Distribute copies of approved schedule to Owner, Program Manager, Architect, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the work and are no longer involved in performance of construction activities.

3.02 CONSTRUCTION PHOTOGRAPHS

- A. Pre-construction Photographs: Before starting construction, take color photographs (digital photographs) of project site and surrounding properties from different vantage points, as well as interior photographs. Take sufficient views and vantage points to ensure all areas to be modified or affected by the work are represented. Show existing conditions adjacent to property and existing interior conditions.
- B. Construction Photographs: During construction, take color photographs (digital photographs) of work in progress or recently completed on regular basis, not less than once per week. When applicable, submit digital photographs of conditions to Architect to facilitate Architect's review of Payment Application and responses to Contractor's Requests for Information.

END OF SECTION

BUILDING FOR ROGERS FACILITIES DEPARTMENT
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DEMX ARCHITECTURE
FAYETTEVILLE, AR

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Sections:
 - 1. Division 1 Section "Payment Procedures" for submitting Applications for Payment and the schedule of values.
 - 2. Division 01 Section "Project Management and Coordination" for submitting Coordination Drawings.
 - 3. Division 01 Section "Quality Requirements" for submitting test and inspection reports and Delegated-Design Submittals and for erecting mockups.
 - 4. Division 01 Section "Closeout Procedures" for submitting warranties, Project Record Documents and operation and maintenance manuals.
 - 5. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 6. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as action submittals.
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as informational submittals.

1.4 SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
 - b. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
- B. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal, and allow for the minimum of the time described below, not to exceed the time demonstrated in the Submittal Look-Ahead Schedule
- C. Electronic Submittal:
 - 1. Shop drawing and product data submittals shall be transmitted to Architect in electronic (PDF) format using Cloud Based Software approved by Architect and Owner, a website service designed specifically for transmitting submittals between construction team members.
 - 2. The intent of electronic submittals is to expedite the construction process by reducing paperwork, improving information flow, and decreasing turnaround time.
 - 3. The electronic submittal process is not intended for color samples, color charts, or physical material samples.
- D. Electronic Submittal Procedures:
 - 1. Create submittal log in Cloud Based Software approved by Architect and Owner by inserting required submittals listed in individual specification sections.
 - 2. Submittal Preparation - Contractor may use any or all of the following options:
 - a. Subcontractors and Suppliers provide electronic (PDF) submittals to Contractor via the Cloud Based Software approved by Architect and Owner website.
 - b. Subcontractors and Suppliers provide electronic (PDF) submittals to Contractor via email.
 - c. Subcontractors and Suppliers provide paper submittals to Scanning Service which electronically scans and converts to PDF format.
 - d. Printed Submittals: Provide two printed sets of submittals for shop drawings for structural framing in addition to electronic submittals if required by architect.
 - e. Contractor shall review and apply electronic stamp certifying that the submittal complies with the requirements of the Contract Documents including

- verification of manufacturer / product, dimensions and coordination of information with other parts of the work.
- f. Contractor shall transmit each submittal to Architect using the Cloud Based Software approved by Architect and Owner
 - g. Architect / Engineer review comments will be made available on the Cloud Based Software approved by Architect and Owner website for downloading. Contractor will receive email notice of completed review.
 - h. Distribution of reviewed submittals to subcontractors and suppliers is the responsibility of the Contractor.
 - i. Submit paper copies of any reviewed submittals not submitted electronically at project closeout for record purposes in accordance with Section 01 77 19 – Contract Closeout.

Contractor will provide Owner/Architect with complete backup of information gathered and stored with Cloud Based Software including but not limited to submittals, project photos, correspondence, RFI, ASI, Project documents, etc.

- E. Costs: General Contractor shall include the full cost of Cloud Based Software approved by Architect and Owner project subscription in their proposal. This cost is included in the Contract Amount.
 - 1. The intent is for the Cloud Based Software such as Submittal Exchange or Procore service cost to be in lieu of postage or shipping costs typically paid for paper submittals. Service cost is a net cost savings to Contractor because submittals sent electronically do not need to be shipped physically.
 - 2. Internet Service and Equipment Requirements:
 - a. Email address and Internet access at Contractor's main office.
 - b. Adobe Acrobat (www.adobe.com), Bluebeam PDF Revu (www.bluebeam.com), or other similar PDF review software for applying electronic stamps and comments
- F. General: Prepare and submit Action Submittals required by individual Specification Sections.
 - 1. Electronic copies: Post electronic submittals as PDF electronic files In Submittal Exchange
 - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file. Do not use, or allow others to use, submittals marked "Rejected – Resubmit as Specified" at the Project Site or elsewhere where Work is in progress
 - 5. "Action Not Taken" - Where a submittal is for information or record purposes or special processing or other activity, the Architect will return the submittal marked "Action Not Taken"
 - a. Informational Submittals: Architect and will review each submittal and will not return it, or will reject and return it if it does not comply with requirements. Architect and Construction Manager will forward each submittal to appropriate party.

- b. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

2.0 FORMS DESCRIPTION

- A. Requests for Information (RFI): Submit requests to the Architect for information or interpretation of Contract Documents on RFI form. Establish and maintain a RFI Log, and number each RFI sequentially.

END OF SECTION 013300- SUBMITTAL PROCEDURES

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 – GENERAL

1.1 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.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections:
 - 1. Division 1 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.
 - 2. Divisions 2 through 16 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect
- C. Mockups: Full size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on the project site, consisting of multiple products, assemblies and subassemblies.
 2. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.
- D. Preconstruction Testing: Tests and inspections performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade or trades.
- J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 ACTION SUBMITTALS

- A. Shop Drawings: For integrated exterior mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.
 - 1. Indicate manufacturer and model number of individual components.
 - 2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.6 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Contractor's Quality-Control Manager Qualifications: For supervisory personnel.
- C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems.
- D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.
 - 4. Identification of applicable standards.
 - 5. Identification of test and inspection methods.
 - 6. Number of tests and inspections required.
 - 7. Time schedule or time span for tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.

1.7 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice of Award and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

1. Project quality-control manager may also serve as Project superintendent
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: Include in quality-control plan a comprehensive schedule of Work requiring testing or inspection, including the following:
 1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
 2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
 3. Owner-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by the Commissioning Authority.
- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.8 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 1. Date of issue.
 2. Project title and number.
 3. Name, address, and telephone number of testing agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.
 6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.

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9. Test and inspection results and an interpretation of test results.
 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and re-inspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of technical representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement that equipment complies with requirements.
 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 4. Statement whether conditions, products, and installation will affect warranty.
 5. Other required items indicated in individual Specification Sections.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.9 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329 and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
 - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - f. When testing is complete, remove test specimens, assemblies, mockups do not reuse products on Project.
 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at the Project.
 4. Demonstrate the proposed range of aesthetic effects and workmanship.
 5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.
 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 7. Demolish and remove mockups when directed, unless otherwise indicated.
- L. Integrated Exterior Mockups: Construct integrated exterior mockup in accordance with approved Shop Drawings or as indicated on Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual specification sections, along with supporting materials.

1.10 QUALITY CONTROL

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- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 - 2. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.
 - 3. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
 - 1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 - 2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 - 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 - 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 - 5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 1 Section "Submittal Procedures."
- D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

- F. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 - 1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 - 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 - 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 - 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 - 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 - 6. Do not perform any duties of Contractor.
- G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
 - 1. Access to the Work.
 - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 - 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 - 4. Facilities for storage and field curing of test samples.
 - 5. Delivery of samples to testing agencies.
 - 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 - 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of the Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.

1. Distribution: Distribute schedule to Owner, Architect testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.11.1 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Contractor will Engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as indicated in Statement of Special Inspections attached to this Section, and as follows:
- B. Special Tests and Inspections: Conducted by a qualified testing agency as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:
 1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
 2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 6. Retesting and re-inspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 ACCEPTABLE TESTING AGENCIES

- A. Contractor shall submit credentials of testing agency to architect/ engineer for approval prior to testing.

3.2 TEST AND INSPECTION LOG

- A. Prepare a record of tests and inspections. Include the following:
 1. Date test or inspection was conducted.
 2. Description of the Work tested or inspected.
 3. Date test or inspection results were transmitted to Architect.
 4. Identification of testing agency or special inspector conducting test or inspection.

- B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.3 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 1 Section "Execution Requirements."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

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SECTION 014010 – STRUCTURAL TESTING AND INSPECTIONS

PART 3 - EXECUTION

3.1 **Jobsite Testing and Inspection Requirements - General**

A. General:

1. Scope of Work
 - a. The owner [design professional in responsible charge] will engage a qualified inspection and testing agency(s) to perform special inspections and testing for all structural members and assemblies as noted herein.
 - b. Special inspections are in addition to inspections by the authority having jurisdiction required by IBC 2021section 110.
 - c. Refer to architectural/mechanical/electrical/civil specifications and drawings for additional special inspection and testing that may be required.
2. Special inspections and testing are applicable to all revisions and/or future work added by amendments to the construction documents.
3. Definitions
 - a. Special inspector: the agency engaged by the owner and approved by the authority having jurisdiction to act as the designated representative to perform inspections.
 - b. Special inspection: inspection performed by the special inspector according to IBC 2021section 1704 to ensure compliance with approved construction documents and referenced standards.
 - c. (P) Periodic inspection: the part-time or intermittent observation by the special inspector of work being performed. Special inspector shall be present in the area where the work is being performed. Observation of all work (100% visual) shall be made at the completion of the work.
 - d. (C) Continuous inspection: the full-time observation by the special inspector of work being performed. Special inspector shall be present in the area where the work is being performed. Observation of all work (100% visual) shall be made at the completion of the work.
 - e. (100%): 100% observation / testing prior to concealment of indicated element.
 - f. Testing and Inspection Type 1: Material Verification and Workman Certifications.
 - g. Testing and Inspection Type 2: Site Inspection for Layout and Quantities.
 - h. Testing and Inspection Type 3: Site Inspection for Procedures and Workmanship.
 - i. Testing and Inspection Type 4: Site Testing for Material Properties and Workmanship.
 - j. Testing and Inspection Type 5: Fabrication Facility Inspection and Testing for Workmanship.
4. Deficiencies in Work
 - a. Correct deficiencies in work that tests and inspections indicate do not comply with the contract documents and referenced standards.
 - b. All cost of additional testing and/or inspections for corrective work shall be borne by the contractor.

B. Shop Fabrications:

1. General

- a. Perform inspections and testing for all shop fabricated structural members and assemblies as noted herein. Special inspector shall perform special inspections and testing unless the fabricator is registered and approved by the authority having jurisdiction to perform such work without special inspection or fabrication has a current ICC-ES evaluation report.
 - b. Special inspector shall verify the fabricator maintains and follows detailed shop fabrication and quality control procedures, unless fabricator is registered and approved.
 - c. At the completion of fabrication, the approved fabricator shall submit a certificate of compliance to the authority having jurisdiction according to IBC 2021 section 1704.2.5.1
 - d. Approved fabricators may perform testing noted herein except that nondestructive testing (NDT) shall only be performed by personnel with qualifications that meet or exceed the criteria of AWS D1.1 subclause 6.14.6 and American Society for Nondestructive Testing (ASNT) SNT-TC-1A or ASNT CP-189.
2. Shop Fabrications Included
- a. Shop fabricated structural steel including stairs and railing elements
 - b. Shop fabricated cold formed steel elements
 - c. Structural precast concrete
 - d. Pre-fabricated wood structural elements
 - e. Shop fabricated steel connections for structural wood connections

3.2 Jobsite Testing and Inspection Requirements for Soils and Foundations

A. Soils Inspection and Testing

1. Excavation Extents and Depths
 - a. Type 2: Site inspection for Layout and Quantities.
 - b. Criteria: Verify excavations are extended to the proper depth and have reached the proper material.
 - c. Frequency: (P) Periodic inspection.
2. Subgrade Material Verification
 - a. Type 2: Site inspection for Layout and Quantities.
 - b. Criteria: Prior to placement of compacted fill, inspect subgrade and verify that site has been prepared properly.
 - c. Frequency: (P) Periodic inspection.
3. Fill materials
 - a. Type 2: Site inspection for Layout and Quantities.
 - b. Criteria: Perform classification and testing of compacted fill materials.
 - c. Frequency: (P) Periodic inspection.
4. Controlled Fill Placement
 - a. Type 2: Site inspection for Layout and Quantities.
 - b. Criteria: Verify use of proper materials, densities, compaction, and lift thicknesses during placement and compaction of compacted fill.
 - c. Frequency: (C) Continuous inspection.
5. Bearing Material Verification
 - a. Type 4: Site Testing for Material Properties and Workmanship.
 - b. Criteria: Verify bearing material is adequate to achieve the design bearing capacity.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: Geotechnical Investigation Report.

6. See civil drawings and/or specifications for additional earthwork and utility inspection requirements.
7. See civil drawings and/or specifications for classification and testing requirements for compacted fill and/or controlled low-strength material.

3.3 Jobsite Testing and Inspection Requirements for Concrete

A. Cast-in-Place Inspection and Testing – Before Concrete Placement

1. Formwork Dimensional Layout.
 - a. Type 2: Site inspection for Layout and Quantities.
 - b. Criteria: Prior to placement of concrete inspect formwork of first pour of each type (grade beam, column, structural slab, slab-on-deck, etc.).
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: ACI 301-16 2.2-2.3
2. Reinforcing Steel Placement.
 - a. Type 2: Site inspection for Layout and Quantities.
 - b. Criteria: Verify grade, finish, size, bar quantity, location, spacing, cover, hook lengths, splice lengths, splice locations, bend diameters, coating, surface conditions, and supports.
 - c. Frequency: 100% observation / testing.
 - d. Standard: ACI 301-16 3.2-3.3.
3. Bolts and Embedments Placement.
 - a. Type 2: Site inspection for Layout and Quantities.
 - b. Criteria: Verify type, finish, diameter, length, quantity, embedment length, spacing and edge distances, use of placing template where specified.
 - c. Frequency: 100% observation / testing.
4. Bolts and Embedments Welding.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Inspect per the jobsite testing and inspection requirements for steel.
 - c. Frequency: See jobsite testing and inspection requirements for steel.
5. Reinforcement Welding.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify ASTM A706 reinforcing steel. Inspect all welds.
 - c. Frequency: (C) Continuous inspection.
6. Reinforcement Field Bending.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Inspect reinforcement field bending.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: ACI 301-16 3.3.2.8.
7. Mechanical Connectors.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Inspect mechanical connectors.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: ICC-ES Report.
8. Epoxy or Galvanized Reinforcing.
 - a. Type 1: Material Verification and Workman Certifications.
 - b. Criteria: Inspect epoxy or galvanized reinforcing.
 - c. Frequency: 100% observation / testing.
 - d. Standard: ACI 301-16 3.2.1.2.
9. Construction of Reshores.

- a. Type 3: Site Inspection for Procedures and Workmanship
- b. Criteria: Verify construction is compliant with construction documents and approved shop drawings.
- c. Frequency: (P) Periodic Inspection.
- d. Standard: ACI 318-14 26.13.3.3

B. Cast-in-Place Inspection and Testing – During Concrete Placement.

- 1. Verify Design Mix.
 - a. Type 1: Material Verification and Workman Certifications.
 - b. Criteria: Verify use of approved design mixture for each truck load.
 - c. Frequency: 100% observation / testing.
 - d. Standard: ACI 318 Ch. 19, 26.4.3, 26.4.4.
- 2. Concrete Placement Inspection.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Inspect placement of concrete per standard (see below).
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: ACI 301-16 5.3.2.
- 3. Concrete Curing Inspection.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Inspect curing of concrete per standard (see below).
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: ACI 301-16 5.3.6.

C. Structural Concrete Testing.

- 1. Note: Nondestructive testing may be permitted by the architect but will not be used as sole basis for approval or rejection of deficient concrete.
- 2. Welding.
 - a. Type 4: Site Testing for Material Properties and Workmanship.
 - b. Criteria: Welding testing and inspection per the jobsite testing and inspection requirements for steel.
 - c. Frequency: See jobsite testing and inspection requirements for steel.
- 3. Composite Concrete Sample – $f'_c < 5000$ PSI.
 - a. Type 4: Site Testing for Material Properties and Workmanship.
 - b. Criteria: Obtain sample at point of placement. For drilled piers obtain near beginning of load prior to placement in shaft.
 - c. Frequency: At least once a day or at least once for each 100 cubic yards of concrete or at least once for each 5,000 square feet of surface area for slabs and walls. Adjust frequency as required to provide minimum 5 total tests per mix but not more than one sample per truck load.
 - d. Standard: ASTM C172.
- 4. Slump/Slump Flow.
 - a. Type 4: Site Testing for Material Properties and Workmanship.
 - b. Criteria: Specified slump shall be as submitted in the mix design $\pm 1 \frac{1}{2}$ ". perform additional tests when concrete consistency appears to change.
 - c. Frequency: Each composite sample (see above).
 - d. Standard: ASTM C143 (slump) or ASTM C1611 (slump flow).
- 5. Air content when air entrainment is specified and lightweight concrete
 - a. Type 4: Site Testing for Material Properties and Workmanship.
 - b. Criteria: Test per standard (see below).
 - c. Frequency: Each composite sample (see above).

- d. Standard: ASTM C231 pressure method for normal weight concrete or ASTM C173 volumetric method for light weight concrete.
- 6. Temperature.
 - a. Type 4: Site Testing for Material Properties and Workmanship.
 - b. Criteria: Test per standard (see below). Required when air temperature is 40 °F and below or 80°F and above.
 - c. Frequency: Each composite sample (see above) and at 60 minute intervals.
 - d. Standard: ASTM C1064.
- 7. Unit weight for structural lightweight concrete.
 - a. Type 4: Site Testing for Material Properties and Workmanship.
 - b. Criteria: Test per standard (see below).
 - c. Frequency: Each composite sample (see above).
 - d. Standard: ASTM C138.
- 8. Cold Weather Curing.
 - a. Type 4: Site Testing for Material Properties and Workmanship.
 - b. Criteria: Record maximum and minimum concrete temperature during curing period when daily average air temperature of 40 °F or below is expected for 3 successive days during curing period.
 - c. Frequency: N/A
 - d. Standard: ASTM C1074.
- 9. Compressive Strength.
 - a. Type 4: Site Testing for Material Properties and Workmanship.
 - b. Criteria: Reports of compressive strength tests shall contain the following information: date of concrete placement, location of concrete batch in work, design 28-day compressive strength, concrete supplier and mixture ID number, time of batch and placement, ambient air temperature, site added water and admixtures, unit weight, and as required by ASTM C39. Acceptance criteria per ACI 318.
 - c. Frequency: Test per schedule below:
 - 1) 7 days: 6x12 or 4x8
 - 2) 28 days: 6x12 or 4x8
 - 3) 56 days: 6x12 or 4x8 (if 28 day tests do not achieve specified 28 day strength).
 - d. Standard: ASTM C31, ASTM C39. Either 6x12 or (6) 4x8 cylinders.

D. Expansion, Sleeve and Screw Anchor Inspection and Testing – Before Anchor Installations

- 1. Verify Installation Procedure.
 - a. Type 1: Material Verification and Workman Certifications.
 - b. Criteria: Review contractor's installation procedure.
 - c. Frequency: 100% observation / testing.
 - d. Standard: ICC-ES Report.
- 2. Verify Anchor Type, Diameter, and Materials.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify anchor products to be used for compliance of anchor type, diameter, materials and product
 - c. Frequency: 100% observation / testing.
 - d. Standard: ICC-ES Report.
- 3. Verify Max Allowed Impact Wrench Torque.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: For screw anchors, confirm the maximum allowed impact wrench torqued as defined by the manufacturer.
 - c. Frequency: (C) Continuous inspection.

- d. Standard: ICC-ES Report.
- E. Expansion, Sleeve and Screw Anchor Inspection and Testing – During Anchor Installations
- 1. Continuous inspection required regardless if periodic inspection is permitted by ICC-ES report.
 - 2. Verify Hole Layout.
 - a. Type 2: Site inspection for Layout and Quantities.
 - b. Criteria: Verify the hole layout matches the contract documents. Review of layout should include number of anchors, spacing, edge distances, and quantity.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: ICC-ES Report.
 - 3. Grout Extents Around Masonry Anchors.
 - a. Type 2: Site inspection for Layout and Quantities.
 - b. Criteria: At masonry anchors, confirm the grout extents surrounding the anchor have been satisfied.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: ICC-ES Report.
 - 4. Verify Hole Diameter, Depth, Cleaning
 - a. Type 2: Site inspection for Layout and Quantities.
 - b. Criteria: Verify the hole diameter and depth meet the manufacturer requirements and the requirements shown on the contract documents. Observe the hole cleaning procedure is in accordance with the anchor manufacturers recommendations.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: ICC-ES Report.
 - 5. Verify Anchor Installation.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify the anchor installation of the anchor is in accordance with the anchor manufacturer recommendations.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: ICC-ES Report.
- F. Expansion, Sleeve and Screw Anchor Inspection and Testing – After Anchor Installations
- 1. Verify Installation of Attached Assembly.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify number, edge distances, and anchor flush with and perpendicular to the receiving surface.
 - c. Frequency: (C) Continuous inspection.
 - 2. Torque Test Anchors.
 - a. Type 4: Site Testing for Material Properties and Workmanship.
 - b. Criteria: Test anchor with calibrated torque wrench to 100% of the installation torque noted in ICC-ES report. Attain specified torque within 1/2 turn of the nut.
 - c. Frequency: 100% observation / testing.
 - d. Standard: ICC-ES Report.
- G. Adhesive Anchors and Reinforcing Inspection and Testing - Before Anchor / Reinforcing Installation
- 1. Verify Installation Procedure.
 - a. Type 1: Material Verification and Workman Certifications.
 - b. Criteria: Review contractor's installation procedure. Verify adhesive to be used for product type, manufacturer recommendations, expiration dates, pot life, working temperature ranges for adhesives, substrates and anchors.

- c. Frequency: 100% observation / testing.
 - d. Standard: ICC-ES Report.
 - 2. Verify Anchor Type, Diameter and Materials.
 - a. Type 2: Site inspection for Layout and Quantities.
 - b. Criteria: Verify anchor to be used for compliance of anchor type, diameter, length, finish, and base material. Verify solid grouted area around anchors in grouted masonry
 - c. Frequency: 100% observation / testing.
 - d. Standard: ICC-ES Report.
- H. Adhesive Anchors and Reinforcing Inspection and Testing - During Anchor/Reinforcing Installation
 - 1. Continuous inspection required regardless if periodic inspection is permitted by ICC-ES report.
 - 2. Verify Hole Layout.
 - a. Type 2: Site inspection for Layout and Quantities.
 - b. Criteria: Verify the hole layout matches the contract documents. Review of layout should include number of anchors, spacing, edge distances, and quantity.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: ICC-ES Report.
 - 3. Grout Extents Around Masonry Anchors.
 - a. Type 2: Site inspection for Layout and Quantities.
 - b. Criteria: At masonry anchors, confirm the grout extents surrounding the anchor have been satisfied.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: ICC-ES Report.
 - 4. Verify Hole Diameter, Depth and Cleaning.
 - a. Type 2: Site inspection for Layout and Quantities.
 - b. Criteria: Verify the hole diameter and depth meet the manufacturer requirements and the requirements shown on the contract documents. Observe the hole cleaning procedure is in accordance with the adhesive manufacturer's recommendations.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: ICC-ES Report.
 - 5. Verify Anchor Installation.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify the anchor installation of the anchor is in accordance with the adhesive manufacturer's recommendations. Verify the temperatures of the adhesive, substrate and anchors are within the manufacturer recommended ranges.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: ICC-ES Report.
- I. Adhesive Anchors and Reinforcing Inspection and Testing - After Anchor / Reinforcing Installation
 - 1. Verify Installation of Attached Assembly.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify number, edge distances, and anchor flush with and perpendicular to the receiving surface. Verify full cure time has elapsed prior to application of torque or load to anchor.
 - c. Frequency: (C) Continuous inspection.
 - 2. Tension Test Anchors / Reinforcing
 - a. Type 4: Site Testing for Material Properties and Workmanship.

- b. Criteria: Test the installation of the first 3 of each type, base material, and position (down, horizontal, overhead). Observe ASTM E488 minimum edge distances for determining test locations. Submit Proposed test locations and requests for required tension test load values to engineer.
- c. Frequency: First 3 and 1% of remaining.
- d. Standard: ASTM E488 Static Tension.

3.4 Jobsite Testing and Inspection Requirements for Steel

A. Steel Testing and Inspection Definitions.

- 1. UT – Ultrasonic Testing.
- 2. MT – Magnetic Particle Testing.
- 3. PT – Penetration Testing.
- 4. SFRS – Seismic Force Resisting System.
- 5. TTT – Tension Through Thickness.

B. Steel Framing – General.

- 1. HDAS, HAS, DAS, Threaded studs.
 - a. Type 5: Fabrication Facility Inspection and Testing for Workmanship.
 - b. Criteria: Review manufacturer certifications for fastener materials.
 - c. Frequency: 100% observation / testing.
 - d. Standard: AISC 360, Chapter N.
- 2. Non-USA Material $\geq 3/4$ " loaded in tension through-thickness (ASTM A435).
 - a. Type 5: Fabrication Facility Inspection and Testing for Workmanship.
 - b. Criteria: Not required for steel produced in USA. Any discontinuity causing a total loss of back reflection that cannot be contained within a circle 3 inches in diameter shall be rejected. Required where noted as 'TTT' in drawings.
 - c. Frequency: 100% observation / testing.
 - d. Standard: AISC 360, Chapter N, ASTM A435.
- 3. Non-USA Material $\geq 3/4$ " embedded plate assemblies - UT Testing.
 - a. Type 5: Fabrication Facility Inspection and Testing for Workmanship.
 - b. Criteria: Not required for steel produced in USA. Test along centerline of plate width after welding.
 - c. Frequency: 100% observation / testing.
 - d. Standard: AISC 360, Chapter N.
- 4. Non-USA Material $\geq 1\ 1/2$ " loaded in tension through-thickness (ASTM A898).
 - a. Type 5: Fabrication Facility Inspection and Testing for Workmanship.
 - b. Criteria: Not required for steel produced in USA. Criteria to be met 6 inches above and below each weld. Required where noted as 'TTT' in drawings
 - c. Frequency: 100% observation / testing.
 - d. Standard: AISC 360, Chapter N, ASTM A898 (Level 1 Criteria).
- 5. MT or PT for thermally cut beam copes and access holes where material ≥ 2 ".
 - a. Type 5: Fabrication Facility Inspection and Testing for Workmanship.
 - b. Criteria: MT or PT for thermally cut beam copes and access holes where material ≥ 2 ". Any crack shall be deemed unacceptable regardless of size or location.
 - c. Frequency: 100% observation / testing.
 - d. Standard: AISC 360, Chapter N.

C. Prior to Bolting.

- 1. Verify Manufacturer's Certifications

- a. Type 1: Material Verification and Workman Certifications.
 - b. Criteria: Verify manufacturer's certifications available for fastener materials.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: AISC 360, Chapter N.
 - 2. Preinstallation bolt testing.
 - a. Type 1: Material Verification and Workman Certifications.
 - b. Criteria: Pre-installation verification testing by installation personnel observed and documented for fastener assemblies and methods used. Not applicable for snug tight joints.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: AISC 360, Chapter N.
 - 3. Verify bolt material, diameter, handling.
 - a. Type 1: Material Verification and Workman Certifications.
 - b. Criteria: Verify bolt material, diameter, and handling. Verify proper storage for fastener components. Verify fasteners marks in accordance with ASTM requirements.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: AISC 360, Chapter N.
 - 4. Verify bolting procedure.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify proper fasteners (grade, type, bolt length if threads are to be excluded from shear plane) and bolting procedure selected for joint detail.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: AISC 360, Chapter N.
 - 5. Verify connecting element preparation.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify connecting elements meet requirements (if specified), including hole preparation and faying surface condition.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: AISC 360, Chapter N.
- D. During Bolting.
- 1. Verify bolts in all holes.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify fastener assemblies of suitable condition placed in all holes and washers are positioned as required.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: AISC 360, Chapter N.
 - 2. Verify bolts positioned as required.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify fasteners placed in all holes and positioned as required.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: AISC 360, Chapter N.
- E. After Bolting.
- 1. Document acceptance/rejection of joints.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Document acceptance/rejection of bolted connections, member or joint.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: AISC 360, Chapter N.

F. Prior to Welding.

1. Verify welder qualifications and ID system.
 - a. Type 1: Material Verification and Workman Certifications.
 - b. Criteria: Review manufacturer certifications for welding consumables and welding procedure specifications. Verify welder identification system. Note: The fabricator or erector, as applicable, shall maintain a system by which a welder who has welded a joint or member can be identified. Stamps, if used, shall be the low-stress type.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: AISC 360, Chapter N.
2. Verify WPS available.
 - a. Type 1: Material Verification and Workman Certifications.
 - b. Criteria: Verify Welding Procedure Specification available.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: AISC 360, Chapter N.
3. Verify base material and weld material.
 - a. Type 1: Material Verification and Workman Certifications.
 - b. Criteria: Verify base material and weld material are in conformance with approved documents.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: AISC 360, Chapter N.
4. Verify weld procedures and weld equipment.
 - a. Type 1: Material Verification and Workman Certifications.
 - b. Criteria: Verify weld procedures and weld equipment are in conformance with approved documents.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: AISC 360, Chapter N.
5. Verify joint fit-up, prep, backing, etc.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify fit up of groove welds (including joint geometry) meet requirements for joint preparation, dimensions (alignment, root opening, root face, bevel), cleanliness (condition of steel surfaces), tacking (tack weld quality and location), and backing type and fit (if applicable). Verify fit up of fillet welds meet requirements for dimensions (alignment, gaps at root), cleanliness (condition of steel surfaces), and tacking (tack weld quality and location). Verify configuration and finish of access holes.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: AISC 360, Chapter N.

G. During Welding.

1. Use of qualified welders.
 - a. Type 1: Material Verification and Workman Certifications.
 - b. Criteria: Verify welder certifications.
 - c. Frequency: (P) Periodic Inspection.
 - d. Standard: AISC 360, Chapter N.
2. Handling of welding consumables.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify proper control and handling of welding consumables including packaging and exposure control.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: AISC 360, Chapter N.

3. No welding over cracked tack welds.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify no welding over cracked tack welds.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: AISC 360, Chapter N.
4. Environment conditions (wind/temp, etc.).
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify Welding Procedure Specification is followed for Environment conditions. Verify wind speed, precipitation, and temperature are within limits.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: AISC 360, Chapter N.
5. Verify WPS followed.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify use of qualified welders. Verify Welding Procedure Specification is followed for settings on welding equipment, travel speed, selected welding materials, shielding gas type/flow rate, preheat applied, interpass temperature maintained (minimum and maximum), proper position (F, V, H, OH).
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: AISC 360, Chapter N.
6. Welding techniques.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify proper welding techniques for single and multi-pass welds (interpass and final cleaning, each pass within profile limitations, each pass meets quality requirements).
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: AISC 360, Chapter N.

H. After Welding.

1. Verify welds cleaned.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify welds cleaned in accordance with standard.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: AISC 360, Chapter N.
2. Verify weld size, length and location.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify weld size, length and location conform to approved documents.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: AISC 360, Chapter N.
3. Welds meet visual acceptance criteria.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify welds meet visual acceptance criteria for crack prohibition, weld/base metal fusion, crater cross section, weld profiles, weld size, undercut, and porosity. Where inspector observes questionable welds, non-destructive testing shall be performed.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: AISC 360, Chapter N, AWS D1.1.
4. Arc strikes.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify no arc strikes are present in the base material. Arc strikes shall be tested using non-destructive methods and repaired if necessary.
 - c. Frequency: (C) Continuous inspection.

- d. Standard: AISC 360, Chapter N.
- 5. Verify no cracking in k-areas and at weld access holes.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: When welding of doubler plates, continuity plate, or stiffeners has been performed in the k-area, visually inspect the web k-area for cracks within 3 inches of the weld.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: AISC 360, Chapter N.
- 6. Repair activities.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify repair activities conform to standard. Backing and weld tabs removed, and fillet welds added where required.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: AISC 360, Chapter N.
- 7. Document acceptance/rejection of joints.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Document acceptance/rejection of welded joints and/or members.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: AISC 360, Chapter N.
- 8. UT CJP welds, material $\geq 5/16"$, I and II.
 - a. Type 4: Site Testing for Material Properties and Workmanship.
 - b. Criteria: Only applies for buildings assigned to Risk Category I or II. Ultrasonic testing of complete joint penetration groove welds subject to transversely applied tension loading in butt, T- and corner joints, in materials thicker than $5/16"$.
 - c. Frequency: 10% observation / testing. The rate of UT shall be increased to 100% if the reject rate of the first 20 inspections is greater than 5%.
 - d. Standard: AISC 360, Chapter N.
- 9. UT CJP welds, material $\geq 5/16"$, III and IV.
 - a. Type 4: Site Testing for Material Properties and Workmanship.
 - b. Criteria: Only applies for buildings assigned to Risk Category III or IV. Ultrasonic testing of complete joint penetration groove welds subject to transversely applied tension loading in butt, T- and corner joints, in materials thicker than $5/16"$.
 - c. Frequency: 100% observation / testing. It is acceptable for the rate of UT to be decreased to 25% if the reject rate of the first 40 inspections is less than or equal to 5%.
 - d. Standard: AISC 360, Chapter N.

3.5 Jobsite Testing and Inspection Requirements for Cold Formed Steel

A.

- 1. Members and connections.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify type, size, location, spacing.
 - c. Frequency: (P) Periodic inspection.
- 2. Bridging and blocking layout and connections.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify type, location, and attachment.
 - c. Frequency: (P) Periodic inspection.

3. No field cuts / notches through flanges.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: No cuts or notches through section flanges permitted.
 - c. Frequency: (P) Periodic inspection.
4. No member splices except where shown.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: No splicing of structural members permitted unless specified on the construction documents.
 - c. Frequency: (P) Periodic inspection.
5. Punchouts are away from bearings/connections.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify spacing requirements from bearings and connections and reinforcing is used where required.
 - c. Frequency: (P) Periodic inspection.
6. Studs seated in tracks per details.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify stud seated tightly within the top and bottom track with gap not exceeding permitted dimension, where gap is exceeded verify shims are provided.
 - c. Frequency: (P) Periodic inspection.
7. Floor framing aligned with studs.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify framing is aligned over a bearing stud within permitted dimension
 - c. Frequency: (P) Periodic inspection.

B. Sheathed Shear Walls.

1. Panel sheathing type and thickness.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify panel sheathing type and thickness. are installed in accordance with the approved documents.
 - c. Frequency: (P) Periodic inspection.
2. Attachment type / spacing at boundaries and field.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify panel sheathing boundary and field fasteners and attachment at all edges of shear wall are installed in accordance with the approved documents.
 - c. Frequency: (P) Periodic inspection.
3. Hold-downs type, size, layout, and connections.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify hold-downs type, size, layout, connections are installed in accordance with the approved documents.
 - c. Frequency: 100% observation / testing.

C. Welded Attachments.

1. Procedures, materials, qualifications.
 - a. Type 1: Material Verification and Workman Certifications.
 - b. Criteria: Verify filler materials, welding procedures, welder qualifications, and manufacturer's certificate of compliance.
 - c. Frequency: 100% observation / testing.
 - d. Standard: AWS D1.1/D1.3.
2. During welding.
 - a. Type 3: Site Inspection for Procedures and Workmanship.

- b. Criteria: Verify welds type, size, layout, and procedure are in accordance with the approved documents.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: AWS D1.3.
 - 3. After welding.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify welds type, size, layout, and procedure are in accordance with the approved documents.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: AWS D1.3.
- D. Screwed Attachments.
 - 1. Type, diameter, length, spacing, edge distance.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify type, diameter, length, spacing, and edge distance are installed in accordance with the approved documents. Verify installation is in conformance with ICC-ES Report.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: ICC-ES Report.
 - 2. Penetration.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify screws are fully driven with a minimum penetration of 3 threads through the last material joined.
 - c. Frequency: (P) Periodic inspection.
 - 3. Connected materials drawn together.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify connected materials have been drawn together.
 - c. Frequency: (P) Periodic inspection.
 - 4. No popped screw heads/stripped threads.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: No popped screw heads/stripped threads are permitted. All damaged screws shall be replaced.
 - c. Frequency: (P) Periodic inspection.
- E. Power-Actuated Fasteners.
 - 1. Type, diameter, length, spacing, edge distance.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify type, diameter, length, spacing, finish, base material, and edge distance are installed in accordance with the approved documents. Verify connected materials have been drawn together.
 - c. Frequency: (P) Periodic inspection. First of each fastener type and base material type.
 - 2. Conformance with ICC-ES Report.
 - a. Type 1: Material Verification and Workman Certifications.
 - b. Criteria: Verify installation is in conformance with ICC-ES Report.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: ICC-ES Report.

3.6 Jobsite Testing and Inspection Requirements for Wood

A. Sheathed Shear Walls and Diaphragms.

1. Sheathing type and thickness.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify type, thickness, panel size and orientation are in conformance with the approved documents.
 - c. Frequency: (P) Periodic inspection. First of each fastener type and base material type.
2. Attachment type / spacing at boundaries and field.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify panel sheathing boundary, panel edge, and field fasteners and attachment at all edges of diaphragm are in conformance with the approved documents.
 - c. Frequency: (P) Periodic inspection. First of each fastener type and base material type.
3. Hold-downs type, size, layout, connections.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify type, size, location, fasteners, and anchorage are in conformance with the approved documents.
 - c. Frequency: 100% observation / testing.

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SECTION 01500:
TEMPORARY FACILITIES AND CONTROLS

PART 1: GENERAL

1.01 Work Included:

- A. Construction facilities and temporary controls required for this work include, but are not necessarily limited to:
 - 1. Project signage.
 - 2. Sanitary facilities.
 - 3. Temporary electricity and telephone.
 - 4. Enclosures such as tarpaulins, barricades, and canopies.

1.02 Related Work:

- A. Comply with all requirements of pertinent regulations described in the General and Supplementary Conditions of the Contract.
- B. Except that equipment furnished by subcontractors shall comply with all requirements of pertinent safety regulations; the ladders, hoists, planks and similar items normally furnished by individual trades in execution of their own portions of the work are not part of this section of these specifications.

1.03 Quality Assurance:

- A. Use all means necessary to maintain temporary facilities and controls in proper and safe condition throughout progress of the work.
- B. In the event of loss or damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2: PRODUCTS

2.01 Construction Facilities and Temporary Controls:

- A. Furnish and install all required temporary toilet buildings with sanitary toilets for use of all workmen. Comply with all minimum requirements of the local health department or other public agency having jurisdiction and maintain in a sanitary condition at all times.
- B. Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity and power requirements during construction. Also provide temporary telephone service for all personnel engaged in construction activities throughout the construction period. Pay all costs for installation, maintenance and removal of telephone system.
- C. Furnish, install and maintain for the duration of construction all required scaffolds, tarpaulins, barricades, canopies, warning signs, steps, bridges, platforms, and other temporary construction

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necessary for proper completion of the work in compliance with all pertinent safety and other regulations.

PART 3: EXECUTION

3.01 Field Quality Control:

- A. Maintain all temporary facilities and controls as long as needed for the safe and proper completion of the work. Remove all such temporary facilities and controls as rapidly as progress of the work will permit or as directed by the Architect.

END OF SECTION

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SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Sections:
 - 1. Division 1 Section "Alternates" for products selected under an alternate.
 - 2. Division 1 Section "Substitution Procedures" for requests for substitutions.
 - 3. Division 1 Section "References" for applicable industry standards for products specified.

1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.2 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
 - 2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within **15** days of receipt of request, or **seven** days of receipt of additional information or documentation, whichever is later.
 - a. Form of Approval: As specified in Division 1 Section "Submittal Procedures."
 - b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section "Submittal Procedures." Show compliance with requirements.

1.3 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
 - 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

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4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
- C. Storage:
1. Store products to allow for inspection and measurement of quantity or counting of units.
 2. Store materials in a manner that will not endanger Project structure.
 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 4. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
 5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 6. Protect stored products from damage and liquids from freezing.
 7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.5 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 3. Refer to Divisions 2 through 16. Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
- B. Product Selection Procedures:.
1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 3. Products:
 - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience **will** be considered
 - b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
 4. Manufacturers:
 - a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience **will** be considered, BUT MUST BE APPROVED BY ARCHITECT.
 5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions,

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and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

- C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
 - 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Division 1 Section "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
 - 1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 - 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - 3. Evidence that proposed product provides specified warranty.
 - 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 - 5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 01 74 00

CLEANING AND WASTE MANAGEMENT

PART 1 GENERAL

1.1 DESCRIPTION

A. Related requirements specified elsewhere:

1. Summary of work: Section 01010
2. Project Coordination: Section 01040
3. Cleaning for specific products or work: Specification section for that work

B. Maintain premises and public properties free from accumulations of waste, debris and rubbish caused by operations.

C. At completion of work, remove waste materials, rubbish, tools, equipment, machinery, and surplus materials, clean all sight exposed surfaces touched by work; leave project clean and ready for continued occupancy.

1.2 SAFETY REQUIREMENTS

A. Standards: Maintain project in accord with governing safety and insurance standards.

B. Hazards control:

1. Store volatile wastes in covered metal containers, and remove from premises daily.
2. Prevent accumulation of wastes which create hazardous conditions.
3. Provide adequate ventilation during use of volatile or noxious substances.

C. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

1. Do not burn or bury rubbish and waste materials on project site.
2. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains.
3. Do not dispose of wastes into streams or waterways.

PART 2 PRODUCTS

2.1 MATERIALS

A. Use only cleaning materials recommended by manufacturer of surface to be cleaned.

B. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 EXECUTION

3.1 DURING CONSTRUCTION

- A. Execute cleaning to ensure that building, grounds, and public properties are maintained free from accumulations of waste materials and rubbish.
- B. Wet down dry materials and rubbish to lay dust and prevent blowing dust.
- C. At reasonable intervals during progress of work, clean site and public properties, and dispose of waste materials, debris and rubbish.
- D. Provide on-site dump containers for collection of waste materials, debris and rubbish.
- E. Remove waste materials, debris and rubbish from site and legally dispose of at public or private dumping areas off owner's property.
- G. Handle materials in a controlled manner with as few handlings as possible, do not throw or drop materials from heights.

3.2 FINAL CLEANING

- A. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces.
- B. Return any surface dirtied or marred to original condition by work.

END OF SECTION 01 74 00

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SECTION 01 77 00
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
- B. Related Sections:
 - 1. Division 1 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 2. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 3. Division 1 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
 - 4. Divisions 2 through 16 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete with request.
 - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - 2. Advise Owner of pending insurance changeover requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 5. Prepare and submit Project Record Documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information. Include full back-up of Project information from contractor's Cloud Based management software related to this project.
 - 6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 - 7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 8. Complete startup testing of systems.

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9. Submit test/adjust/balance records.
 10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 11. Advise Owner of changeover in heat and other utilities.
 12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
 13. Complete final cleaning requirements, including touchup painting.
 14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for final completion.

1.4 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
 2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report and warranty.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. **Submit demonstration and training video recordings.**
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. **Use CSI Form 14.1A or other form approved by Architect and Owner.**

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1. Organize list of spaces in sequential order, **starting with exterior areas first and proceeding from lowest floor to highest floor.**
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.
4. Submit list of incomplete items in the following format:
 - a. PDF electronic file.

1.6 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated..
- B. Partial Occupancy: Submit properly executed warranties within **15** days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive **8-1/2-by-11-inch (215-by-280-mm)** paper.
 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
 1. Use cleaning products that meet Green Seal GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.
 - l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates.
 - m. Wipe surfaces of mechanical and electrical equipment, **elevator equipment**, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - n. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
 - o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

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- p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - q. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter upon inspection.
 - 1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report upon completion of cleaning.
 - r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - s. Leave Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.
- D. Construction Waste Disposal: Comply with waste disposal requirements in **Division 1 Section "Temporary Facilities and Controls."** **Division 1 Section "Construction Waste Management."**

END OF SECTION

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SECTION 01 78 00 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Procedural requirements for maintaining documents and samples at the site as required in the General Conditions. Coordinate with Sections 22-27 for Mechanical and Electrical requirements.
- B. The General Conditions require the Contractor to maintain a record copy of the following for Architect's review:
 - 1. Drawings showing architectural and engineering systems and components.
 - 2. Specifications and Schedule (Project Manual).
 - 3. Addenda.
 - 4. Change Orders and other documents which modify original document.
 - 5. Approved shop drawings, product data and samples.
 - 6. Records of all changes made during construction.
- C. In addition to the above, Contractor shall maintain at the site a record copy of the following:
 - 1. Field test records.
 - 2. Manufacturer's certificates.
 - 3. Fixed equipment manuals.
 - 4. Inspection certificates.

1.02 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. Store Record Documents and samples in a file in the Field Office, apart from the documents used for construction. Provide files, racks and secure storage for Record Documents and samples.
- B. Label and file Record Documents in sequence with section number listings in Table of Contents of this Project Manual. Label each document "PROJECT RECORD" in the lower right hand corner in neat, large printed letters.
- C. Maintain Record Documents in clean, dry, legible condition. Do not use Record Documents for construction purposes.
- D. Keep Record Documents and samples available for inspection by Architect and Engineer.

1.03 RECORDING

- A. Record information concurrently with construction progress. Do not conceal work until required information has been recorded.
- B. Contract Drawings and Shop Drawings: Legibly mark each item to record actual construction, including the following:
 - 1. Depth of footings in relation to finish first floor level.
 - 2. Measure horizontal and vertical locations of underground utilities, valves, etc. referenced to building exterior lines. Show direction of flow of pipe and depth of piping underground.

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3. Field changes of dimensions and details.
 4. Changes made by Contract Modifications.
 5. Details not on original Contract Drawings.
 6. Fixed equipment.
- C. Project Manual: Legibly mark to record actual construction, including the following:
1. On appropriate pages, record changes made by Addenda, Change Orders and other modifications.
 2. On appropriate pages, enter trade name, manufacturer, catalog number, and name of supplier of each product and item actually installed, if different from that specified.
 3. Other items installed but not originally specified.

1.04 RECORD DRAWINGS

- A. Record Drawings which are required for Owner's records, shall be recorded on reproducibles by the General Contractor. These reproducibles shall be transmitted to the General Contractor by the Architect prior to the start of Construction. Do not use Record Drawings for construction purposes.
- B. General Contractor shall transfer all changes recorded on construction drawings on the Record Drawings.
1. All information shall be recorded neatly and legible.
 2. Use separate colors for recording information about each major system.
 3. Establish a code to denote the color for each trade and indicate by a schedule placed on the front sheet of the Record Drawings.

1.05 SUBMITTALS

- A. At Contract Closeout, deliver Record Documents and samples, including Record Drawings, and surveyor's certificate for building location, first floor elevation, handicap ramps, to Architect.
- B. Submit Record Documents under cover of a transmittal letter containing:
1. Date.
 2. Project title and number.
 3. Contractor's and subcontractor's names and addresses.
 4. Title and number of each Record Document.
 5. Certification that each document submitted is complete and accurate.
 6. Signature of Contractor or his authorized representative.

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

END OF SECTION

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SECTION 01 78 23 –
OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
1. Operation and maintenance documentation directory.
 2. Emergency manuals.
 3. Operation manuals for systems, subsystems, and equipment.
 4. Maintenance manuals for the care and maintenance of **products, materials, and finishes, systems and equipment.**
- B. Related Sections include the following:
1. Division 1 Section "Closeout Procedures" for submitting operation and maintenance manuals.
 2. Division 1 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
 3. Divisions 2 through 16 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 SUBMITTALS

- A. Initial Submittal: Submit digital copies of each manual at least **15** days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Architect will return digital copy of draft and mark whether general scope and content of manual are acceptable.
- B. Final Submittal: Submit digital copy and one copy of each manual in final form at least **15** days before final inspection. Architect will return copy with comments within **15** after final inspection.
1. Correct or modify each manual to comply with Architect's comments. Submit digital copies of each corrected manual within **15** days of receipt of Architect's comments.

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1.5 COORDINATION

- A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Organization: Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

- B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name, address, and telephone number of Contractor.

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6. Name and address of Architect.
 7. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
1. Binders (if requested by Owner): Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold **8-1/2-by-11-inch (215-by-280-mm)** paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
 4. Supplementary Text: Prepared on **8-1/2-by-11-inch (215-by-280-mm)** white bond paper.
 5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.

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3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.

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8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

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F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard printed maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training videotape, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

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G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

1. Do not use original Project Record Documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared Record Drawings in Division 1 Section "Project Record Documents."

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G. Comply with Division 1 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION

SECTION 01 78 36

WARRANTIES AND BONDS

PART 1 GENERAL

1.1 SUMMARY

- A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturers standard warranties on products and special warranties.
- B. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.2 WARRANTY REQUIREMENTS

- A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
 - 1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- E. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

1.3 SUBMITTALS

- A. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.

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1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect within fifteen days of completion of that designated portion of the Work.
- B. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner through the Architect for approval prior to final execution.
- C. Bind warranties and bonds in heavy duty, commercial quality, durable 3 ring vinyl covered loose leaf binders.
 1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer.
 2. Identify binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS, the Project title or name, and the name of the Contractor.
 3. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 PRODUCTS (not applicable).

PART 3 EXECUTION

3.1 SCHEDULE OF WARRANTIES

- A. Schedule: Provide warranties and bonds on products and installations as specified.

END OF SECTION 01 78 36

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Footings.
 - 2. Slabs-on-grade.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
 - 2. Submit substantiating data for each concrete mix design contemplated for use to the Architect no less than four weeks prior to first concrete placement. Data for each mix shall include the following:
 - a. Mix identification number (unique for each mix submitted).
 - b. Statement of intended mix use.
 - c. Mixture proportions.
 - d. Water/cementitious materials ratio.
 - e. Wet and dry unit weight.
 - f. Total air content.
 - g. Design slump and allowable range after additions of all admixtures.
 - h. Time limits on discharge: If time of discharge exceeds ACI 301 90 minute time limit, submit concrete properties criteria at permissible time of discharge and additional special inspection and testing requirements associated with time limits.

- i. Compressive strength tests.
3. Shrinkage testing per ASTM C 157.
- C. Before submitting concrete design mixtures to the architect for review, contractor shall review concrete design mixture for applications, state on the submittal where the concrete mix will be used, establish procedures for ensuring quality of concrete materials and verify suitability of mix design for placement and finishing.
- D. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
 1. Show all reinforcing, top and bottom profile of concrete element, supports below, including beams, columns and walls, grade beams, concrete walls, joists, etc. framing into element.
 2. Show locations of approved construction joints, locations of pour strips, splices of reinforcing, type of splice used and splice location. Identify all ASTM A706 and epoxy coated reinforcing locations.
- E. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 1. Location of construction joints is subject to approval of Architect.

1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each of the following, signed by manufacturers:
 1. Cementitious materials.
 2. Admixtures.
 3. Form materials and form-release agents.
 4. Steel reinforcement and accessories.
 5. Fiber reinforcement.
 6. Waterstops.
 7. Curing compounds.
 8. Bonding agents.
 9. Vapor retarders.
 10. Repair materials.
- B. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
 1. Aggregates: Submit test reports indicating that aggregates are not potentially reactive based on the ASTM C295 or ASTM 1260 testing limits set forth in section 5.1 of “Guide Specification for Concrete Subject to Alkali-Silica Reactions” (2007 Portland Cement Association). Alternatively, submit ASTM C1567 test reports indicating that the combination of mix ingredients reduces the expansion due to Alkali aggregate reactivity such that the mix complies with section 5.2 of “Guide Specification for Concrete Subject

to Alkali-Silica Reactions” (2007 Portland Cement Association). All tests for submitted reports shall have been performed within one year of the submittal date.

- C. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- D. Minutes of preinstallation conference.
- E. Placement Notification: Submit notification to Architect at least 24 hours in advance of placement.
- F. Proposed location of saw cut joints not indicated on Drawings.
- G. Curing compound data demonstrating specified moisture loss performance.
- H. Evaporative retarder product and application data.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Associate and a supervisor who is an ACI-certified Concrete Flatwork Finisher.
- B. 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.
- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
 - 3. Personnel inspecting concrete reinforcing steel have current certification as an ACI Concrete Construction Inspector or have experience in concrete construction acceptable to the Architect.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."

- F. Formwork: Contractor shall be responsible for design and engineering of formwork. Design of formwork and preparation of formwork drawings shall be performed under supervision of a qualified engineer registered in the state of the project.
- G. 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."
- H. Mockups: Cast concrete slab-on-grade and formed-surface panels to demonstrate typical joints, surface finish, texture, tolerances, floor treatments, and standard of workmanship.
 - 1. Build panel approximately 200 sq. ft. (18.6 sq. m) for slab-on-grade in the location indicated or, if not indicated, as directed by Architect.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- I. Preinstallation Conference: Conduct conference at Project site or by video conference call.
 - 1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Ready-mix concrete manufacturer.
 - c. Concrete subcontractor.
 - d. Special concrete finish subcontractor.
 - e. Owner's Testing/Inspection Agency.
 - f. Engineer by video call
 - g. Architect by video call
 - 2. Review as applicable to Project special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, methods for achieving floor and slab flatness and levelness, floor and slab flatness and levelness measurement, concrete repair procedures, concrete protection, field sampling procedures for concrete cylinders and air testing, initial curing and field curing of field test cylinders (ASTM C31/C31M), protection of field cured field test cylinders.
 - 3. Minutes of the meeting shall be recorded by Contractor and distributed to all parties within five days. Provide one copy to Owner's representative and Architect.
- J. Record of Work: Maintain a record listing time and date of all structural concrete placement. Such record shall be kept until completion of Project and shall be available to Architect for examination at any time.

- K. Pre-Placement Inspection: Formwork installation, reinforcing steel placement and installation of all items to be embedded or cast into concrete shall be verified by Contractor prior to placement.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement if present.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

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.
 - 1. Plywood, metal, or other approved panel materials.
 - 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
 - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - c. Structural 1, B-B or better; mill oiled and edge sealed.
 - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- 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.
- C. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch minimum.
- E. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- F. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- G. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 1/2" inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Total recycled content not less than 95 percent.
- B. All steel reinforcement shall be produced using an electric arc furnace.
- C. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 deformed.
- D. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed, where welding of reinforcement or field bending is noted on Drawings.
- E. Epoxy-Coated Reinforcing Bars: ASTM A 615/A 615M, Grade 60 ASTM A 706/A 706M for bars that may be field bent, deformed bars, ASTM A 775/A 775M or ASTM A 934/A 934M for bars that are prefabricated, epoxy coated, with less than 2 percent damaged coating in each 12-inch bar length.
- F. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.
- G. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.
- H. Epoxy-Coated Welded Wire Reinforcement: ASTM A 884/A 884M, Class A coated, Type 1, plain steel.

2.3 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 plain-steel bars, cut true to length with ends square and free of burrs.
- B. Epoxy-Coated Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 plain-steel bars, ASTM A 775/A 775M epoxy coated.
- C. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775/A 775M.
- D. 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," of greater compressive strength than concrete and as follows:
 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 1. Ordinary Portland Cement: ASTM C 150, Type as indicated on drawings,
 2. Blended Hydraulic Cement: ASTM C 595, Type IL, portland-limestone
 3. Supplementary Cementitious Materials (SCM): Of proportions and type to meet concrete performance criteria as indicated in the structural drawings. Available SCM's that may be incorporated into the Work include, but are not limited to, 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.
 - c. Silica Fume: ASTM C 1240, amorphous silica.
- B. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials. All coarse and fine aggregate shall be tested per ASTM C 295 or ASTM C 1293 in accordance with section 5.1 of "Guide Specification for Concrete Subject to Alkali-Silica Reactions" (2007 Portland Cement Association).
 1. Maximum Coarse-Aggregate Size:-As indicated on Drawings.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable or ASTM C 1602 tested non-potable which is compatible with admixtures.

2.5 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.
- C. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and not containing more chloride ions than are present in municipal drinking water and complying with ASTM C 494/C 494M, Type C for set accelerating use and ASTM C1582 for corrosion-inhibitor use.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Axim Italcementi Group, Inc.; CATEXOL CN-CI.
 - b. BASF Construction Chemicals - Building Systems; Rheocrete CNI.
 - c. Euclid Chemical Company (The), an RPM company; ARRMATECT, EUCON BCN, or EUCON CIA.
 - d. Grace Construction Products, W. R. Grace & Co.; DCI.
 - e. Sika Corporation; Sika CNI.
- D. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete complying with and ASTM C1582 for corrosion-inhibitor use.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Construction Chemicals - Building Systems; Rheocrete 222+.
 - b. Cortec Corporation; MCI- 2000 or 2005NS.
 - c. Grace Construction Products, W. R. Grace & Co.; DCI-S.
 - d. Sika Corporation; FerroGard 901.

2.6 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
1. VOC Content: Evaporation retarders shall have a VOC content of 780 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Axim Italcementi Group, Inc.; CATEXOL CimFilm.
 - b. BASF Construction Chemicals - Building Systems; Confilm.
 - c. ChemMasters; SprayFilm.
 - d. Conspec by Dayton Superior; Aquafilm.
 - e. Dayton Superior Corporation; Sure Film (J-74).
 - f. Edoco by Dayton Superior; BurkeFilm.

- g. Euclid Chemical Company (The), an RPM company; Eucobar.
- h. Kaufman Products, Inc.; Vapor-Aid.
- i. Lambert Corporation; LAMBCO Skin.
- j. L&M Construction Chemicals, Inc.; E-CON.
- k. Meadows, W. R., Inc.; EVAPRE.
- l. Metacrete Industries; Waterhold.
- m. Nox-Crete Products Group; MONOFILM.
- n. Sika Corporation; SikaFilm.
- o. SpecChem, LLC; Spec Film.
- p. Symons by Dayton Superior; Finishing Aid.
- q. TK Products, Division of Sierra Corporation; TK-2120 TRI-FILM.
- r. Unitex; PRO-FILM.
- s. Vexcon Chemicals, Inc.; Certi-Vex Envio Set.

- 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.

2.7 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, [epoxy resin with a Type A shore durometer hardness of 80] [aromatic polyurea with a Type A shore durometer hardness range of 90 to 95] per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 - 1. [Types I and II, non-load bearing][Types IV and V, load bearing], for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Reglets: Fabricate reglets of not less than 0.022-inch- thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

2.8 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.9 CONCRETE MIXTURES, GENERAL

- 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. Use a qualified testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Limit water-soluble, chloride-ion content in hardened concrete.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing, high-range 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.
 4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

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.

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. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch for smooth-formed finished surfaces.
 - 2. Class B, 1/4 inch, Class C, 1/2 inch, Class D, 1 inch for rough-formed finished surfaces.
 - 3. The permissible irregularity is a cumulative value due to all sources including layout, plumbness, member size, formwork offsets, joints, and member levelness. The permissible irregularity shall also apply between adjacent concrete surfaces on opposite sides of construction joint, expansion joint or shrinkage pour strip if present.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement. Form release agent shall have a VOC content of 250 g/L [450 g/L] or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- M. All formwork surfaces that support concrete exposed to view must be accepted by Architect prior to concrete placement.

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.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303 "Code of Standard Practice for Steel Buildings and Bridges."
 - a. Tolerance of Embedded Items: Comply with ACI 117.
 - 1) Anchor Rods:
 - a) Plumbness: Within +/- 1/16 inch over anchor rod projection.
 - 2) Embedded Plates and Weldments:
 - a) Location: +/- 1 inch vertical, +/- 1 inch horizontal.
 - b) Plumb and Alignment: 1/4 inch in 12 inches (1:48).
 - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.

2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
 3. Leave formwork and shoring in place a minimum of 15 days after concrete placement unless reshoring is used.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORES AND RESHORES

- A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- B. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 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 in accordance ASTM E1643.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.
- D. Size, length, number and placement of supports shall be sufficient as to maintain reinforcing position within specified tolerances during construction traffic and concrete placement.
- E. On vertical formwork, use approved bar chairs or spacers as required to maintain concrete cover and bar position. Do not staple or use any other metallic fastener to secure bolsters, chairs, etc. to formwork for concrete surfaces exposed to exterior.
- F. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

- G. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
- H. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.

3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 in into concrete.
 - 3. Locate joints for slabs in the middle third of spans.
- C. 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.
 - 3. Interior Slabs-on-Grade to Receive Carpet or Wood Floor Covering: Construct slabs as large a placement area as practical. Unless noted otherwise on Drawings, locate construction joints on column centerlines. Provide control joints at column centerlines and at intervals not more than 30 feet each way.
 - 4. All Other Interior Slabs-on-Grade: Unless noted otherwise on Drawings, locate construction joints on column centerlines. Locate control joints where shown on Drawings. If not shown, provide control joints at column centerlines and at intervals not more than 10 feet each way.
- D. 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.
 - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.

2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.7 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. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. 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. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Maintain reinforcement in position on chairs during concrete placement.
 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 4. Slope surfaces uniformly to drains where required.
 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
 - 1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.8 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, to receive a rubbed finish, to be covered with a coating or covering material applied directly to concrete
- C. 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.

3.9 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, re-straightening, 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 to receive concrete floor toppings
- 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 re-straightening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restrain 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 exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system
- E. Top of surface for slabs
 - 1. Slabs on ground shall be +/- 0.75"
 - 2. Formed suspended slabs, before removal of supporting shores +/- 0.75"
- F. Slab surface finish tolerance: Finish slab surfaces to the following tolerances according to ASTM E 1155 (ASTM E 1155M) for a randomly trafficked floor surface:
 - 1. Slabs on grade (conventional): Specified overall values of flatness, SOF(F) 20; and of levelness, SOF(L) 15; with minimum local values of flatness, MLF(F) 17; and of levelness, MLF(L) 15.
 - 2. Slabs on grade (moderately flat): Specified overall values of flatness, SOF(F) 25; and of levelness, SOF(L) 20; with minimum local values of flatness, MLF(F) 17; and of levelness, MLF(L) 15.
 - 3. Slabs on grade (flat): Specified overall values of flatness, SOF(F) 35; and of levelness, SOF(L) 25; with minimum local values of flatness, MLF(F) 24; and of levelness, MLF(L) 17; for slabs-on-grade.
 - 4. Suspended formed slabs: Specified overall values of flatness, SOF(F) [30]; and of levelness, SOF(L) [20]; with minimum local values of flatness, MLF(F) [20]; and of levelness, MLF(L) [15]. Values are prior to form work removal.

5. Suspended slabs on metal deck: Specified overall values of flatness, SOF(F) [30]; and no limit for levelness, SOF(L); with minimum local values of flatness, MLF(F) [20]; and of no limit for levelness, MLF(L).
 6. Slabs on grade (very flat): Specified overall values of flatness, SOF(F) 45; and of levelness, SOF(L) 35; with minimum local values of flatness, MLF(F) 30; and of levelness, MLF(L) 24.
 7. Slabs on grade (Super flat): Specified overall values of flatness, SOF(F) 60; and of levelness, SOF(L) 40; with minimum local values of flatness, MLF(F) 36; and of levelness, MLF(L) 27.
 8. Floor Finishes that require local flatness numbers more restrictive than those specified above shall be achieved by the use of floor leveling compound or by grinding.
 9. At construction joints, finish and measure surface so gap at any point along the joint between concrete surface and an unlevelled, freestanding, 10-ft. long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch. Grind or fill-in surface of concrete to meet limits above at construction joints.
 10. Finish and measure surface so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft. long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.
- G. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- H. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, shop floors, and elsewhere as indicated.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- 3.10 MISCELLANEOUS CONCRETE ITEMS
- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
 - B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.11 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. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. 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 with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch over adjacent absorptive covers.
 - 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. Moisture-retaining-cover shall be inspected each day by Contractor. Any areas which do not show condensation on underside of cover or any slab areas which are not wet shall be immediately rewetted and cover replaced to prevent moisture loss.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.

- c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
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.
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.

3.12 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.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning and that are unacceptable to Architect. Allow Architect and Structural Engineer to observe concrete surfaces upon removal of forms and prior to repair of surface defects. Defects in structural concrete shall be brought to the attention of the Architect and Structural Engineer.
 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template. Submit proposed repair to Architect for review prior to commencement of work.
1. Repair finished surfaces containing defects that are unacceptable to Architect. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.031 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.13 FIELD QUALITY CONTROL

- A. Testing and Inspection: As indicated on Drawings.

3.14 PROTECTION OF LIQUID FLOOR TREATMENTS

- A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 033000

SECTION 03 36 00 - SPECIAL CONCRETE FLOOR FINISHES

PART 1 GENERAL

1.01 SUMMARY

- A. This section Provides polished concrete finishing system where indicated on the drawings.
 - 1. Concrete floor substrate grinding to a specified finish.
 - 2. Applying dye sealer, hardener and densifier (Retroplate 99) and performing grinding and polishing to a specified finish.

1.02 REFERENCES

- A. American Society for Testing and Materials:
 - 1. ASTM-C779, Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces
 - 2. ASTM G23-81, Ultraviolet Light & Water Spray
 - 3. ASTM C805, Impact Strength
- B. American Concrete Institute: ACI 302. 1R-89, Guide for Concrete Floor and Slab Construction
- C. Other Test: Reflectivity

1.03 SUBMITTALS

- A. Comply with provisions of Section 01 33 00 - Submittals.
- B. Product data:
 - 1. Submit special concrete finishes manufacturer's specifications and test data.
 - 2. Submit special concrete finishes describing product to be provided, giving manufacturer's name and product name for the specified material proposed to be provided under this section.
 - 3. Submit special concrete finishes manufacturer's recommended installation procedures; which when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the work.
 - 4. Submit special concrete finishes technical data sheet giving descriptive data, curing time, and application requirements.

5. Follow all special concrete finishes published manufacturer's installation instructions.
- C. Test Reports: Provide certified test reports, prepared by an independent testing laboratory, confirming compliance with specified performance criteria.
- D. Samples: Each floor has its own unique appearance when completed. Manufacturer's lab samples are supplied only to show a smooth surface indicative of the gloss, not the mix color or aggregate size, color or amount of aggregate exposed. The final appearance of a finished floor cannot be guaranteed to match a sample due to the natural variations in concrete.
- E. Product Variations: RetroPlate and Solvent-based Dyes. The variegated colors and appearance are unique to each concrete surface and depend on the chemical composition, mix design, porosity, age, texture and color of the concrete substrate. Mottling and wide variations in color and intensity may occur. If contaminants remain on the surface, the penetration of the RetroPlate and Solvent-based Dye may be blocked. Concrete from different loads or pours, and in patched areas, may appear significantly different in color from adjacent areas, when treated with RetroPlate or Solvent-based dye.
- F. Fly Ash: No more than 20% of the weight of the Portland cement should be substituted for with fly ash. If fly ash is to be Class substituted, C is preferred.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications:
 1. Use a certified installer and adequate number of skilled workmen who are thoroughly trained and experienced in the necessary craft.
 2. The special concrete finish manufacturer (Advanced Floor Products) shall certify the applicator.
 3. Applicator shall be familiar with the specified requirements and the methods needed for proper performance of work of this section. Applicator must have availability of proper equipment to perform work within scope of this project on a timely basis. Applicator should have successfully performed a minimum of 6 projects of at least 5000 square feet each.
- B. Manufacturer's Certification: Provide letter of certification from Advanced Floor Products stating that installer is certified applicator of special concrete finishes, and is familiar with proper procedures and installation requirements required by the manufacturer.

C. Mock-ups:

1. Apply mock-ups of each type finish, to demonstrate typical joints, surface finish, color variation (if any), and standard of workmanship.
 - a. Build mock-ups approximately 30 square feet in the location indicated or if not indicated, as directed by the Architect or Owner Representative.
 - b. Notify Architect or Owner Representative seven days in advance of dates and times when mock-ups will be constructed when practical.
 - c. Obtain from the Architect or Owner Representative approval of mock-ups before starting construction.
 - d. If the Architect or Owner Representative determines that mock-ups do not meet requirements, demolish and remove them from the site and cast others until mock-ups are approved.
 - e. Maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed work.
 - f. Approved mock-ups may become part of the completed work if undisturbed at time of substantial completion.

2. Protection

- a. All hydraulic powered equipment must be diapered to avoid staining of the concrete.
- b. No trade will park vehicles on the inside slab. If necessary to complete their scope of work, drop cloths will be placed under vehicles at all times.
- c. No pipe cutting machine will be used on the inside floor slab.
- d. Steel will not be placed on interior slab to avoid rust staining.
- e. All equipment must be equipped with non-marking tires.
- f. Do not drag or drop equipment or material across the slab which will scratch or chip it.
- g. No satisfactory chemical or cleaning procedure is available to remove petroleum stains from the concrete surface. Prevention is therefore essential.

- D. Pre-Installation Conference: Schedule and conduct pre-installation conference at project site to establish guidelines and expectations for providing special concrete floor finish specified, including application requirements, degree of polish, concrete finish specifications, substrate tolerances, and similar issues. Make available approved control sample for understanding of desired finish.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original containers, with seals unbroken, bearing manufacturer labels indicating brand name and directions for storage.
- B. Dispense special concrete finish material from factory numbered and sealed containers. Maintain record of container numbers.

1.06 PROJECT CONDITIONS

- A. Environmental Requirements:
 - 1. Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting special concrete floor finish.
 - a. Concrete must have an average Floor Flatness rating of at least 35.
 - b. Concrete must have an average Floor Levelness rating of at least 40.
 - c. Concrete must be cured a minimum of 28 days or as directed by the manufacturer before application of Retro Plate can begin.
 - 2. Application of Retro-Plate shall take place prior to installation of equipment or racking, thus providing a complete, uninhibited concrete slab for application.
 - 3. Close areas to traffic during floor application and after application, for a time period recommended in writing by manufacturer.
 - 4. The completed Retroplated slab will be covered to prevent damage by the other trades during store completion.
 - 5. Owner will be responsible for providing disposal of slurry and finish by products in compliance with all applicable codes.

PART 2 - PRODUCTS

2.01 MATERIALS AND MANUFACTURERS

A. Hardening/Sealing Agent

1. RetroPlate 99 manufactured by Advanced Floor Products, Inc., P.O. Box 50533, Provo, Utah 84605, 888-942-3144. www.retroplatesystem.com
 - a. Performance Criteria:
 - i. Abrasion Resistance: ASTM C779 – Up to 400% increase in abrasion resistance.
 - ii. Impact Strength: ASTM C805 – Up to 21% increase impact strength.
 - iii. Ultra Violet Light and Water Spray: ASTM G23-81 – No adverse effect to ultra violet and water spray.
 - iv. Reflectivity: Up to 30% increase in reflectivity.

B. Solvent-Based Dye Color

1. AmeriPolish Dye distributed by RetroPlate System 1-888-942-3144.
2. Color chart available at www.ameripolish.com
3. Any request for product substitution must be approved by the Manufacturers' Representative and the Architect.

C. Heavy Duty Stain Inhibitor and Sealer: Retroguard by Advanced Floor Products (No Substitution)

D. Diamond Grinding and Polishing Discs: Only grinding and polishing discs distributed by Advanced Floor Products are to be used by Certified RetroPlate Applicator only.

1. Contact: For additional information go to www.retroplatesystem.com, or Leo Henderson & Curtis Turnbull at RetroPlate for list of Certified Applicators and product questions. Leo@retroplatesystem.com, curtis@retroplatesystem.com, or 1-888-942-3144

E. Joint Filler: RetroPlate PE75 Flexible Control Joint Filler

2.04 RELATED MATERIALS

A. Water: Potable

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS:

- A. Examine substrate, with owner representative present, for conditions affecting performance of finish. Correct conditions detrimental to timely and proper work. Do not proceed until unsatisfactory conditions are corrected.
- B. Verify that base slab meets finish and surface profile requirements in Division 3 Section "Cast-In-Place Concrete," and Project Conditions above.
- C. Prior to application, verify that floor surfaces are free of construction latents

3.02 APPLICATION

- A. The following RetroPlate process for new and/or existing construction will be followed as listed below:

New Construction

A concrete grinding machine must be used. Floors should be started using the diamond Grit Metal or Resin pad he sees necessary depending of the condition of the slab. The remaining process follows:

- 1. Grind floor using 50 or 100 grit resin diamond, paying close attention to expose only fine aggregate, physically seen as speckle or sand (Class B – Fine Aggregate). Continue until scratch pattern is uniform throughout.
- 2. Scrub and rinse floor.
- 3. Grind floor using 200 grit resin diamond.
- 4. Scrub and rinse floor.
- 5. Grind floor using 400 grit resin diamond.
- 6. Double Scrub and rinse floor.
- 7. Apply RetroPlate 99 to floor at 200 sq. ft. per gallon, scrubbing product into the floor and allowing product to soak until turning slick. If it becomes sticky, apply water to RetroPlate 99, leaving the product on the floor for at least 60 minutes.
- 8. Scrub and rinse floor to remove any dirt or residue. Let the floor dry overnight.
- 9. Grind floor using 800 grit resin diamond
- 10. Scrub and rinse floor.
- 11. Grind floor using 1500 or 1600 grit resin diamond, to achieve a Level 3 shine, achieving a gloss reading of 60 or higher, and at 50 ft, side lighting & overhead lighting will be well defined.
- 12. Scrub and rinse floor.

13. Apply RetroGuard at the rate of 1200 feet per gallon. Dilute RetroGuard 50-50 with water prior to application using sprayer. Burnish with high speed burnisher.
14. After concrete grinding, cut control joints. Clean concrete substrate of dirt, chalk, markings and saw-cut debris.

B. Finish Requirements

1. Start any of the floor finish applications in presence of manufacturer's technical representative.
2. Sealing, Hardening and Polishing of Concrete Surface: Concrete must be in place a minimum of 28 days or as directed by the manufacturer before application can begin.
3. Application is to take place prior to racking and other in-store accessory installation, thus providing a complete, uninhibited concrete slab for application.
4. Only a certified applicator shall apply Retro-Plate 99 and Dye. Applicable procedures must be followed as recommended by the product manufacturer and as required to match approved test sample.
5. Achieve waterproofing, hardening, dust-proofing, and abrasion resistance of the surface without changing the natural appearance of the concrete, except for the color and sheen.
6. Polish to required polish level.

3.03 WORKMANSHIP AND CLEANING:

- A. The premises shall be kept clean and free of debris at all times.
- B. Remove spatter from adjoining surfaces, as necessary.
- C. Repair damages to surface caused by cleaning operations.
- D. Remove debris from jobsite. Dispose of materials in separate, closed containers in accordance with local regulations.

3.04 SPECIFIC QUALIFICATIONS / EXCLUSIONS:

- A. Removal of contamination of the slab by soil, foot prints, drag marks, welding marks, hydraulic fluids, or any other outside contaminant will be at time and materials, and will be performed to the best of ability, but without guarantee of removal.
- B. Assumption that the RetroPlate 99 System will be applied prior to the installation of any floor covering.
- C. No other trades will be allowed in the area being worked on due to possible safety and floor contamination issues.
- D. The areas to receive the RetroPlate 99 System will be delivered to the applicator in clean and swept condition. All equipment and supplies will be removed prior to turning the space over to the applicator. If the applicator is required to clean the space, and/or move other's supplies, staging and equipment, it will be done at time and materials.
- E. PROTECTION OF THE FLOOR FOLLOWING THE APPLICATION OF THE RETROPLATE 99 SYSTEM AND POLISHING IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR.
- F. Applicator will provide all materials including buffing/polishing pads & CreteClean Plus for one (1) month of recommended, routine floor maintenance. All material including brushes/pads shall remain at the project location and be stored in the janitor's closet. Applicator shall also provide floor finish maintenance instructions for Owner.

3.05 PROTECTION:

- A. Protect finished work until fully cured in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 05 12 00 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Structural steel.
 - 2. Grout.

- B. Related Sections:

- 1. Section Appendix B "Quality Requirements" for independent testing agency procedures and administrative requirements.
 - 2. Section 099600 "Exterior Painting" for surface-preparation and priming requirements.

1.3 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.4 PERFORMANCE REQUIREMENTS

- A. Connections:

- 1. Provide connections as shown or noted on Drawings. Design of connections not shown or noted shall be provided by Structural Engineer-of-Record upon request.
 - 2. Alternate connections designed by the contractors registered design professional may be substituted by the Contractor, subject to Structural Engineer-of-Record approval. Proposed changes to connections shall be submitted as a substitution request in advance of the submittal of shop drawings for conceptual approval of Structural Engineer-of-Record. Connections shall be designed for loads indicated on drawings or provided by Structural Engineer-of-Record. Loads indicated are developed using Load and Resistance Factor Design (LRFD) load combinations unless noted otherwise. One set of calculations for all alternate connections signed and sealed by a qualified engineer shall be submitted with or in advance of applicable shop drawings. Contractor shall submit alternate connections to the AHJ in accordance with IBC section 107.3.4.1 Deferred Submittal and 107.4 Amended Construction Documents.

- B. Construction: Refer to the Drawings for description of lateral load resisting system.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop and Erection Drawings: Show location, fabrication, and assembly of structural-steel components.
 - 1. Location of each piece or detail within the structure.
 - 2. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 3. Include embedment piece and setting drawings.
 - 4. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 - 5. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
 - 6. Drawings submitted in multiple packages shall contain individual submittals complete with all applicable erection drawings, details, and piece drawings.
 - 7. Reproduction of Contract Documents is not permitted.
 - 8. Provide schedule for submittal of shop and erection drawings.
- C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer and fabricator.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Mill test reports for structural steel, including chemical and physical properties and steel mill of origin.
 - 1. For structural steel products that are manufactured in a different facility than where the raw material is produced, the mill test report or separate letter included with the report shall clearly indicated the location of both facilities.
 - 2. If structural steel elements are sourced from multiple facilities, mill test reports shall be provided for each facility with a statement outlining the applicability of each report submitted.
- E. Product Test Reports: For the following if present on project:
 - 1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 2. Direct-tension indicators.
 - 3. Tension-control, high-strength bolt-nut-washer assemblies.
 - 4. Shear stud connectors.
 - 5. Shop primers.

6. Nonshrink grout.

- F. Fabricator qualifications: Provide written documentation from the fabricator summarizing their commitment to sustainable practices as outlined in Part 2 – Products.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: A steel fabricator that has at least 5 years of history performing work of similar magnitude to this project
- B. Erector Qualifications: A steel erector that has at least 5 years of history performing work of similar magnitude to this project.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- D. Comply with applicable provisions of the following specifications and documents:

1. AISC 303 -2016 as amended below:

- a. Section 3.2: Replace entire section with the following: "Requirements for structural steel including quantities, sizes, locations, arrangement, and details shall be shown or noted in the overall Contract Drawing package. Fabricator is responsible for incorporating all such information from structural, architectural, mechanical, and electrical drawings, as well as those of other disciplines."
- b. Section 3.5: Remove all text after first sentence.
- c. Section 3.6: Replace entire section with the following: "When the fast-track project delivery system is selected, release of structural drawings shall constitute release for construction only if specifically noted as such on the drawing. Drawing indicated "preliminary" or "not for construction" shall not be used for detailing or construction except where the risk of any cost or delay associated with subsequent revisions to Contract Documents is accepted by the Owner, Contractor or Fabricator."
- d. Section 4.4: Revise second sentence to read the following: "The shop and erection drawings shall be returned in accordance with the schedule defined in Division 1 of the project Specification. In the absence of such schedule, the Owner's Designated Representative for Design shall return submittals within 14 calendar days of receipt from the Owner's Designated Representative for Construction."

2. AISC 360.

3. RCSC's "Specification for Structural Joints Using High-Strength Bolts."

- E. Preinstallation Conference: Conduct conference at Project site.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.9 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

- A. HSS Shapes: As indicated on Drawings.
- B. Angles -Shapes: As indicated on Drawings.
- C. Plate and Bar: As indicated on Drawings.
- D. Cold-Formed Hollow Structural Sections: As indicated on Drawings.
- E. Welding Electrodes: Comply with AWS requirements, 70 Series
 1. Conform to Charpy V-Notch test requirements of AISC 360.
 2. Conform to Charpy V-Notch test requirements of AISC 341 for components included in the Seismic-Load-Resisting System.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. Use Tension-Control, High-Strength Bolt-Nut-Washer Assemblies whenever possible unless indicated otherwise.
- B. High-Strength Bolts, Nuts, and Washers: ASTM F 3125, Group 120, (ASTM A 325M), Type 1 A325 or F1852. Heavy-hex steel structural bolts; ASTM A 563, Type 1 Grade C, (ASTM A 563M, Class 8S) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M),

- Type 1, hardened carbon-steel washers; or Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers all with plain finish.
- C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
1. Finish: Plain.
- D. Steel Headed Stud Anchors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- E. Unheaded Anchor Rods: ASTM F 1554, Grade 55, weldable.
1. Configuration: Straight.
 2. Nuts: ASTM A 563 (ASTM A 563M) heavy-hex carbon steel.
 3. Plate Washers: ASTM A 36/A 36M carbon steel.
 4. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
 5. Finish: Plain.
- F. Headed Anchor Rods: ASTM F 1554, Grade 55, weldable, straight.
1. Nuts: ASTM A 563 (ASTM A 563M) heavy-hex carbon steel.
 2. Plate Washers: ASTM A 36/A 36M carbon steel.
 3. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
 4. Finish: Plain.
- G. Threaded Rods: ASTM A 36/A 36M.
1. Nuts: ASTM A 563 (ASTM A 563M) heavy-hex carbon steel.
 2. Washers: ASTM A 36/A 36M carbon steel.
 3. Finish: Plain.
- H. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1030.
- I. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.
- J. Deformed Anchor Studs (DAS) / Deformed Bar Anchors (DBA): Made from ASTM A 108 low carbon steel, cold worked and deformed per ASTM A 1064. Minimum yield stress = 60 ksi (415 MPa); minimum tensile strength = 80 ksi (550 MPa).
- K. Rebar: Rebar used for welding shall meet the requirements of ASTM A-706. Minimum bend diameters per ACI 318.
- L. Expansion Anchors, Screw Anchors, and Adhesive Anchors: Size and Manufacturer as indicated on Drawings. Complete assemblies with required rods, nuts, washers, and adhesive system as applicable. Installed in accordance with Manufacturer's installation instructions. Current ICC approval and published ICC Research Report required.

1. Finish for use in conditioned environments free from potential moisture (interior): Plain or in accordance with Manufacturer's standard.
2. Finish for use in exposed or potentially wet environments and for attachment of exterior cladding materials: Galvanized in conformance with ASTM A 153 or stainless steel, Series 316.

2.3 PRIMER

- A. Primer: Where steel is to be field painted, provide fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.
- B. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.

2.4 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time. Minimum compressive strength = 6000 psi (41 MPa). Required where grout is exposed to view or weathering.

2.5 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.
 1. Camber structural-steel members where indicated.
 2. Fabricate beams with rolling camber up.
 3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
 4. Mark and match-mark materials for field assembly.
 5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations, if applicable.
- B. Sustainable Fabrication: Fabricate structural steel products in a facility that has demonstrated a commitment to sustainable practices in accordance with one of the following:
 1. An internal sustainability plan or policy with consideration of energy consumption, waste output, and education of employees on sustainability of steel.
 2. Commitment to the American Institute of Steel Construction (AISC) sustainability partner program.
- C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- D. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces. Do not enlarge bolt holes by burning.

- E. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- F. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 2, "Hand Tool Cleaning or SSPC-SP 3, "Power Tool Cleaning."
- G. Steel Headed Stud Anchors and Deformed Anchor Studs / Deformed Bar Anchors: Prepare steel surfaces as recommended by manufacturer of anchors. Use automatic end welding of anchors according to AWS D1.1/D1.1M and manufacturer's written instructions.
- H. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.
 - 1. Cut, drill, thermal cut, or punch holes perpendicular to steel surfaces.
 - 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
- I. Splices: Splicing of members to obtain required lengths is not permitted without prior approval of structural Engineer-of-Record unless indicated on the Drawings.
- J. Substitutions: Where exact sizes and weights indicated on Drawings are not readily available, secure approval of alternate sizes from Structural Engineer-of Record in time to prevent project delay.

2.6 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: As indicated on Drawings.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.7 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
 - 2. Surfaces to be field welded, including top flange of beams to receive steel headed stud anchors.
 - 3. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 - 4. Surfaces not otherwise indicated to be painted that are not exposed to view or weather in the final condition.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to either of the following specifications and standards:

1. SSPC-SP 2, "Hand Tool Cleaning."
 2. SSPC-SP 3, "Power Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection.

2.8 SOURCE QUALITY CONTROL

- A. Testing and Inspection: As indicated on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
1. Coordinate installation of non-structural steel items that load the temporarily supported steel frame such that temporary supports are adequate to resist all imposed loads.
 2. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.
 3. Do not apply permanent loading other than the weight to supported concrete slab-on-deck assemblies to composite beams and girders until concrete has achieved 75 percent of its design strength without prior approval of structural Engineer-of-Record.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

- B. Base Bearing and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 3. Clean and moisten surfaces to receive grout. Immediately remove any remaining free water. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature of 70° F (21° C) when structure is completed and in service.
- E. Splice members only where indicated.
 - 1. Fasten splices in compression after bearing surface have been brought into contact. Close all gaps greater than 1/16" (2 mm) by driving non-tapered mild steel shims full depth of bearing surface along full length of gap.
- F. Do not use thermal cutting during erection unless approved by Structural Engineer-of-Record. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- H. Steel Headed Stud Anchors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: As indicated on Drawings.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs where indicated on Drawings, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.5 FIELD QUALITY CONTROL

- A. Testing and Inspection: As indicated on Drawings.

3.6 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.
- B. Touchup Painting: Cleaning and touchup painting are specified in Section 099113 "Exterior Painting" Section 099123 "Interior Painting."

END OF SECTION 05 12 00

SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior load-bearing wall framing.
 - 2. Floor joist framing.
- B. Related Sections include the following:
 - 1. Division 05 Section "Metal Fabrications" for masonry shelf angles and connections.
 - 2. Division 09 Section "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.
 - 3. Division 09 Section "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.

1.3 SUBMITTALS

- A. Product Data: For each type of cold-formed metal framing product and accessory indicated.
- B. Shop Drawings: Provide 1/4" = 1'-0" scale elevations of all walls and plans of all soffits comprised of cold-formed metal framing. Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
 - 1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:

1. Steel sheet.
2. Expansion anchors.
3. Powder-actuated anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Horizontal drift deflection clips
7. Miscellaneous structural clips and accessories.
8. Stiff Clips

1.5 QUALITY ASSURANCE

- A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.
- C. Special Inspections and Testing: Special inspections and tests indicated on the construction documents and indicated within this specification are minimum requirements. The cold-formed metal framing construction documents shall include the minimum testing and inspection requirements as indicated on the construction documents and shall include additional testing and inspections that the engineer of the cold-formed metal framing engineer requires. All special inspections and tests (minimum design requirements on construction documents and those specified by cold-formed metal framing engineer) shall be paid for by the Owner.
- D. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.
- E. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
- F. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- G. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
 1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Truss Design."
 2. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Allied Studco.
 - 2. AllSteel Products, Inc.
 - 3. California Expanded Metal Products Company.
 - 4. Clark Steel Framing.
 - 5. Consolidated Fabricators Corp.; Building Products Division.
 - 6. Craco Metals Manufacturing, LLC.
 - 7. Custom Stud, Inc.
 - 8. Dale/Incor.
 - 9. Design Shapes in Steel.
 - 10. Dietrich Metal Framing; a Worthington Industries Company.
 - 11. Formetal Co. Inc. (The).
 - 12. Innovative Steel Systems.
 - 13. MarinoWare; a division of Ware Industries.
 - 14. Quail Run Building Materials, Inc.
 - 15. SCAFCO Corporation.
 - 16. Southeastern Stud & Components, Inc.
 - 17. Steel Construction Systems.
 - 18. Steeler, Inc.
 - 19. Super Stud Building Products, Inc.
 - 20. United Metal Products, Inc.

2.2 MATERIALS

- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 - 1. Grade: As indicated.
 - 2. Coating: G60 or equivalent
- B. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
 - 1. Grade: As indicated.

2. Coating: G90 or equivalent.

2.3 LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 1. Minimum Base-Metal Thickness: as indicated.
 2. Flange Width: as indicated.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:
 1. Minimum Base-Metal Thickness: as indicated.
 2. Flange Width: as indicated.
- C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, punched, with stiffened flanges, and as follows:
 1. Minimum Base-Metal Thickness: as indicated.
 2. Flange Width: as indicated.

2.4 FLOOR JOIST FRAMING

- A. Steel Joists: Manufacturer's standard C-shaped steel joists, of web depths indicated, unpunched, with stiffened flanges, and as follows:
 1. Minimum Base-Metal Thickness: as indicated.
 2. Flange Width: as indicated.
- B. Steel Joist Track: Manufacturer's standard U-shaped steel joist track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
 1. Minimum Base-Metal Thickness: as indicated.
 2. Flange Width: as indicated.

2.5 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers, knee braces, and girts.
9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

2.6 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Anchor Bolts: ASTM F 1554, Grade [36] [55], threaded carbon-steel [hex-headed bolts] ~~[[headless, hooked bolts]]~~ ~~[[headless bolts, with encased end threaded,]]~~ and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by [hot-dip process according to ASTM A 153/A 153M, Class C] ~~[[mechanically deposition according to ASTM B 695, Class 50]]~~.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
- D. Powder-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20.
- B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and

plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

- D. Shims: Load bearing, high-density multimonomer plastic, nonleaching.
- E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.8 FABRICATION

- A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
 - 4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.
- C. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.
- D. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

- A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.
- D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place,

undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

- G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.
- H. Install insulation, specified in Division 07 Section "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.
- J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 LOAD-BEARING WALL INSTALLATION

- A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
 - 1. Anchor Spacing: To match stud spacing.
- B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:
 - 1. Stud Spacing: As indicated.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.
- D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.
- E. Align floor and roof framing over studs. Where framing cannot be aligned, continuously reinforce track to transfer loads.
- F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.
- G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
 - 1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.

2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.
- H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.
- I. Install horizontal bridging in stud system, spaced 48 inches Fasten at each stud intersection.
1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of 2 screws into each flange of the clip angle for framing members up to 6 inches deep.
 2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- J. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.
- K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 JOIST INSTALLATION

- A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.
- B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
 2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.
- C. Space joists not more than 2 inches from abutting walls, and as follows:
1. Joist Spacing: As indicated.
- D. Frame openings with built-up joist headers consisting of joist and joist track, nesting joists, or another combination of connected joists if indicated.

- E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated[**on Shop Drawings**].
 - 1. Install web stiffeners to transfer axial loads of walls above.
- F. Install bridging at intervals indicated[**on Shop Drawings**]. Fasten bridging at each joist intersection as follows:
 - 1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
 - 2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.
- G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.
- H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.6 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Shop fabricated steel and aluminum items.

1.2 RELATED REQUIREMENTS

- A. Section 05 12 00 - Structural Steel Framing: Structural steel column anchor bolts.

1.3 REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2014 (2015 Errata).
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2014.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength 2014, with Editorial Revision (2017).
- E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes 2020.
- F. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing 2014.
- G. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.
- H. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.
- I. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.
- J. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2014.
- K. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination 2012.
- L. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

PART 2 PRODUCTS

2.1 MATERIALS - STEEL

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A500/A500M Grade B cold-formed or hot rolled, ASTM A501/A501M; seamless structural tubing.
- C. Plates: ASTM A283/A283M.

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- D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- E. Stainless Steel, General: ASTM A666, Type 304.
- F. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.
- G. Bolts, Nuts, and Washers: ASTM A307, Grade A, plain.
- H. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- I. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- J. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.2 MATERIALS - ALUMINUM

- A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.
- B. Sheet Aluminum: ASTM B209 (ASTM B209M), 5052 alloy, H32 or H22 temper.
- C. Bolts, Nuts, and Washers: Stainless steel.

2.3 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. 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.
- D. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.4 FABRICATED ITEMS

- A. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.
- B. Plates Not Attached to Structural Framing: For support of metal decking; prime paint finish.
- C. Lintels: As detailed; galvanized finish.
- D. Door Frames for Overhead Door Openings: Channel sections; prime paint finish.

2.5 FINISHES - STEEL

- A. Prime paint steel items.
 - 1. Exceptions: Galvanize items to be embedded in concrete and items to be embedded in masonry.
 - 2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.
- B. Prepare surfaces to be primed in accordance with SSPC-SP2.
- C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- D. Prime Painting: One coat.
- E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.

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- F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.6 FINISHES - ALUMINUM

- A. Exterior Aluminum Surfaces: Class I color anodized.
- B. Interior Aluminum Surfaces: Class I natural anodized.

2.7 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.3 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Perform field welding in accordance with AWS D1.1/D1.1M.
- D. Obtain approval prior to site cutting or making adjustments not scheduled.
- E. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.4 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

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SECTION 06 01 00 - ROUGH CARPENTRY

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. This Section includes the following:
 - 1. Framing with dimension lumber.
 - 2. Wood furring, grounds, nailers, and blocking.
 - 3. Sheathing.
- B. Related Section:
 - Section 05 40 00 – Cold-Formed Metal Framing
 - Section 06 20 00 - Finish Carpentry
 - Section 09 21 16 – Gypsum Board Assemblies

1.03 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Section 01 33 00 of the Specification.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Keep materials under cover and dry. Protect from weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

PART 2 - PRODUCTS

2.01 LUMBER, GENERAL

- A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.
- B. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill

- C. 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.

1. Provide dressed lumber, S4S, unless otherwise indicated.
2. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2" nominal thickness or less, unless otherwise indicated.

2.02 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. General: Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with applicable requirements of AWWA C2 (lumber) and AWWA C9 (plywood). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.
- B. Pressure treat aboveground items with waterborne preservatives to a minimum retention of 0.25 lb/cu. ft. After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 and 15 percent, respectively. Treat indicated items 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, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 3. Wood floor plates installed over concrete slabs directly in contact with earth.
- C. Complete fabrication of treated items before treatment, where possible. If cut after treatment, apply field treatment complying with AWWA M4 to cut surfaces. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.
- D. Fasteners used to secure, or in contact with preservative treated lumber shall meet the requirements of the treated lumber manufacturer.

2.03 DIMENSION LUMBER

- A. Lumber - For lumber not exceeding 4" thick or 4" wide, use Construction Grade lumber of any species, or board size lumber, as required. For framing 2" to 4" thick and no more than 6" wide provide No. 2 Southern Pine, 19% maximum moisture content. For framing 2" to 4" thick and 8" to 12" wide, provide No. 1 Dense Southern Pine, 19% maximum moisture content.

2.04 PLYWOOD

- A. Plywood - Where exposed on interior use APA Interior Type with Grade A exposed face and Grade D concealed. Where concealed by other work, APA Type C-D Plugged Interior Grade with exterior glue. For roof use APA Plugged Exterior Grade.

2.05 GYPSUM SHEATHING

- A. Gypsum Sheathing Board: G-P Gypsum Corp., 5/8" Dens-Glass Exterior Sheathing. Install according to manufacturer's written recommendations.

2.06 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of Type 304 stainless steel.
- B. Nails, Wire, Brads, and Staples: FS FF-N-105.
- C. Power-Driven Fasteners: CABO 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.

PART 3 – EXECUTION

3.01 INSTALLATION, GENERAL

- A. Discard units of material with defects that impair quality of rough carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.
- C. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.
- D. Apply field treatment complying with AWWA M4 to cut surfaces of preservative-treated lumber and plywood.
- E. Securely attach rough carpentry work to substrate by anchoring and fastening.
- F. Use common wire nails, unless otherwise indicated. Use finishing nails for finish work. 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; pre-drill as required.
- G. Use hot-dip galvanized or stainless steel nails where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity.

3.02 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

- A. Install wood grounds, nailers, blocking, and sleepers where shown and/or where required for screening or attaching other work. Form to shapes shown and cut as required for true line and level of attached work. Coordinate locations with other work involved. Blocking shall include supports for walls, ceiling breaks, cabinets, counters, doors, shelves, platforms, windows, railings, partitions, wood trim and bases.
- B. Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

3.03 WOOD FRAMING, GENERAL

- A. Framing Standard: Comply with AFPA's "Manual for Wood Frame Construction," unless otherwise indicated.
- B. Install framing members of size and at spacing indicated.
- C. Do not splice structural members between supports.

3.04 GYPSUM SHEATHING

- A. General: Fasten gypsum sheathing to exterior flange of exterior steel studs. Attach to studs with rust resistant screws spaced 8" o.c. at end of each panel and 8" o.c. at each intermediate support. Keep perimeter fasteners 3/8" from edges and ends of units. Fit units tightly against each other and around openings. Carefully follow manufacturer's instruction for installation and joint treatment.

3.05 MISCELLANEOUS

- A. Provide 4' x 8' plywood panels, or of size required, on wall for telephone equipment and computer equipment where located on electrical plans.

END OF SECTION

SECTION 06 20 00 - FINISH CARPENTRY

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 DESCRIPTION

- A. This Section includes wood trim, wood railings and other mill items, installation of hardware and hanging wood doors.

1.03 RELATED WORK SPECIFIED ELSEWHERE

Section 05 50 00 – Metal Fabrications
Section 06 01 00 - Rough Carpentry
Section 06 40 00 – Interior Architectural Woodwork
Section 08 14 16 - Flush Wood Doors

1.04 STANDARDS

- A. Except as otherwise shown or specified comply with provisions of Architectural Woodwork Institute (AWI) "Quality Standards".

1.05 SUBMITTALS

- A. Submit shop drawings and manufacturer's product data. Shop drawings shall show location of each item, dimensioned plans and elevations, large scale details, attachment devices and other components.
- B. Submit fabricator's certification stating that the fabricated work meets the woodwork grades specified.

1.06 PROTECTION

- A. Protect woodwork during transit, delivery, storage and handling to prevent damage, soiling and deterioration.
- B. Do not deliver woodwork until painting, wet work and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, woodwork must be stored in other than installation areas, store only in areas which meet the requirements specified for installation areas.
- C. Maintain temperature and humidity in installation area as required to maintain moisture content of installed woodwork within a 1.0 percent tolerance of the

optimum moisture content, from the date of installation through the remainder of the construction period. The fabricator of the woodwork shall determine the optimum moisture content and required temperature and humidity conditions.

1.07 QUALITY STANDARDS

- A. For the following types of architectural woodwork comply with the indicated standards:

Standing and running trim and rails - AWI Section 300
Miscellaneous work - AWI Section 700

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Provide kiln-dried lumber with an average moisture content range of 6% to 11% interior work. Maintain temperature and relative humidity during fabrication, storage and finishing operations so that moisture content values for woodwork at time of installation do not exceed 5% to 10% for interior wood finish.
- B. Interior wood for transparent finish:
1. See drawings.
- C. Screws: Select material, type, size and finish required for each use. Comply with FS FF-S-111 for applicable requirements. For attachment of wood trim to interior steel framing use USG Type S Trim Head Screws, or equal.
- D. Nails: Select material, type, size and finish required for each use. Comply with FS FF-N-105 for applicable requirements.

2.02 WOODWORK DESIGN AND FABRICATION

- A. Comply with the details shown for profile and construction of architectural woodwork and, where not otherwise shown, comply with applicable Quality Standards, with alternate details at Fabricator's option.
- B. Machine and sand woodwork to comply with requirements of Standards for specified grade.
- C. Before proceeding with fabrication of woodwork required to be fitted to other construction, obtain measurements and verify dimensions and shop drawing details as required for accurate fit. Where sequence of measuring substrates before fabrication would delay the project, proceed with fabrication (without field measurements) and provide ample borders and edges to allow for subsequent scribing and trimming of woodwork for accurate fit.

2.03 INTERIOR ARCHITECTURAL WOODWORK

- A. Fabricate interior woodwork to dimensions, profiles and details shown. Rout or groove reverse side (backed-out) of trim members to be applied to flat surface, except for members with ends exposed in finish work.
- B. Interior woodwork will have either a transparent finish or painted finish as noted on the Drawings for each condition.
- C. Standing and Running Trim, Rails, and Miscellaneous Items - Custom Grade.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Condition woodwork to average prevailing humidity conditions in installation areas prior to installing.
- B. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level; and with 1/16" maximum offset in flush adjoining surfaces, 1/8" maximum offsets in revealed adjoining surfaces.
- C. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.
- D. Anchor woodwork to anchors or blocking built-in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing for a complete installation. Use fine finishing nail for exposed nailings, countersunk and filled flush with woodwork, and matching finish where transparent finish is indicated.
- E. Install standing and running trim with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns, miter at corners, and comply with Quality Standards for joinery.

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- F. Repair damaged and defective woodwork wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace woodwork. Adjust joinery for uniform appearance.

END OF SECTION

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

- 1. Subflooring.

1.3 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 plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 - 3.
 - 4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
 - 1. Preservative-treated plywood.

1.4 QUALITY ASSURANCE

- A. Forest Certification: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria":
 - 1. Plywood.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack plywood and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS, GENERAL

- A. Plywood: Conform to product standard PS-1-[latest edition] and APA Plywood Design specifications PDS [latest edition]. Provide exposure 1 except where surface or edge of plywood will be exposed to weather, then use exterior grade.
- B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- C. Factory mark panels to indicate compliance with applicable standard.

2.2 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWWA C9.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction
- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- C. Application: Treat all plywood, unless otherwise indicated

2.3 SUBFLOORING AND UNDERLAYMENT

- A. Plywood Combination Subfloor-Underlayment: DOC PS 1, 32/16 Exposure 1, Underlayment single-floor panels.
 - 1. Span Rating: Not less than 24
 - 2. Nominal Thickness: Not less than 23/32 inch (18.3 mm)
 - 3. Edge Detail: Tongue and groove.

2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

- B. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
 - 1. For wall and roof sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
- D. Use box 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. Install fasteners without splitting wood.
- E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30S, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Combination Subfloor-Underlayment:
 - a. Screw to cold-formed metal framing.
 - b. Space panels 1/8 inch (3 mm) apart at edges and ends.
 - 2. Subflooring:
 - a. Screw to cold-formed metal framing.
 - b. Space panels 1/8 inch (3 mm) apart at edges and ends.

END OF SECTION 061600

SECTION 06 40 00 - INTERIOR ARCHITECTURAL WOODWORK

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 DESCRIPTION

- A. This section includes wood shelving, cabinets, counters, and other mill items.

1.03 RELATED WORK SPECIFIED ELSEWHERE

Section 05 50 00 – Metal Fabrications
Section 06 10 00 - Rough Carpentry
Section 06 20 00 - Finish Carpentry
Section 08 14 16 - Flush Wood Doors
Section 08 81 00 - Glazing
Section 09 91 00 - Painting
Section 10 28 00 - Toilet and Bath Accessories

1.04 STANDARDS AND WARRANTIES

- A. Except as otherwise shown or specified comply with provisions of Architectural Woodwork Institute (AWI) "Quality Standards".
- B. Provide a labor and material warranty for all casework to repair or replace defective materials or workmanship for 5 years from the date of Substantial Completion.

1.05 SUBMITTALS

- A. Submit shop drawings, samples and other data as indicated. Shop drawings shall show location of each item, dimensioned plans and elevations, large scale details, attachment devices and other components.
- B. Furnish samples of proposed plastic laminate for use in selecting colors.
- C. Submit fabricator's certification stating that the fabricated work meets the woodwork grades specified.

1.06 PROTECTION

- A. Protect cabinet work during transit, delivery, storage, and handling to prevent damage, soiling and deterioration.
- B. Do not deliver cabinetwork until painting, wet work, and similar operations which could damage, soil or deteriorate cabinetwork have been completed in installation areas. If, due to unforeseen circumstances, cabinetwork must be stored in other than installation areas, store only in areas which meet the requirements specified for installation areas.

- C. Maintain temperature and humidity in installation area as required to maintain moisture content of installed cabinetwork within a 1.0 percent tolerance of the optimum moisture content, from the date of installation through the remainder of the construction period. Fabricator of cabinetwork shall determine the optimum moisture content and required temperature and humidity conditions.

1.07 GENERAL

- A. Provide kiln-dried with an average moisture content range of 6% to 11%. Maintain temperature and relative humidity during fabrication, storage and finishing operations so that moisture content values for cabinetwork at time of installation do not exceed 5 - 10%.
- B. Comply with the details shown for profile and construction of cabinetwork and, where not otherwise shown, comply with applicable Quality Standards, with alternate details at Fabricator's option.
- C. Fabricate cabinetwork with pre-cut openings, wherever possible, to receive hardware, plumbing fixtures, electrical work and similar items. Ensure proper fit of equipment to be inserted in cabinetwork. Locate openings accurately and use roughing-in diagrams for proper size and shape. Smooth edges of cutouts and, where located in countertops, seal edges of cutouts with a water-resistant coating.
- D. Before proceeding with fabrication of cabinetwork required to be fitted to other construction, obtain measurements and verify dimensions and shop drawing details as required for accurate fit. Where sequence of measuring substrates before fabrication would delay the project, proceed with fabrication (without field measurements) and provide ample borders and edges to allow for subsequent scribing and trimming of woodwork for accurate fit.

1.08 QUALITY STANDARDS

- A. For the following types of architectural woodwork comply with the indicated standards as applicable:

Wood cabinetwork - AWI Sections 400A Premium Grade.
Countertops - AWI Section 400C.

PART 2 - PRODUCTS

2.01 CASEWORK

- A. Where noted on Drawings provide plastic-laminate covered, flush overlay cabinetwork, AWI Premium Grade.
- B. Plastic Laminate, Formica, Wilsonart, Nevamar, or equal:
 - 1. For horizontal surfaces - NEMA GP-50.
 - 2. For vertical surfaces - NEMA GP-50 or GP-28.
- C. Plastic laminate finish is as follow: PLAM 1 is Formica, Planked Coffee Oak #7413. PLAM 2 is Formica, Neutral White #918-58.

- D. Face construction shall be flush overlay type. Provide 3/4" thick doors, drawer fronts and fixed panels except where required to be thicker by the Standards; and provide flush units.
- E. Exposed veneer and solid wood parts shall be Plain-Sliced Oak.
- F. Interior wood for painted finish:
 - 1. Solid wood - Poplar complying with requirements for specified woodwork grade.
 - 2. Plywood - Softwood with exterior glue and Medium Density Overlay, PS 1.

2.02 PLASTIC LAMINATE COUNTERTOPS FOR CASEWORK

- A. Countertops shown to be laminate covered shall be AWI Premium Grade.
- B. Construct counters as shown or, if details are not shown, comply with standards. Where back and side splashes are shown they shall be 4" high, top mounted square butt joint, fully covered with matching plastic laminate, eased edges.
- C. Exposed counter edges shall have plastic laminate matching surface, unless otherwise indicated. Ease exposed edges of overlap sheet.
- D. Cut openings for equipment to be installed. Comply with equipment manufacturer's requirements, but provide internal corners of 1/8" minimum radius. Smooth saw cut and ease edges.
- E. Seal cut edges of counter at openings for sinks and other "wet" equipment, using waterproofing compound recommended by plastic laminate manufacturer and compatible with laminating adhesive.

2.03 CABINETWORK HARDWARE

- A. Provide operating cabinetwork hardware as follows:
 - 1. Each drawer: BLUM Metabox 320 Series $\frac{3}{4}$ " extension drawer assembly.
 - 2. Each hinged cabinet door: 1 pair hinges, BLUM CLIP. Provide locks where shown on Drawings. Keying shall be compatible with drawer locks.
 - 3. Adjustable shelf hardware: K&V standards 255AL, (side mounted) with 4 - K&V supports 256 per shelf, or equal.
 - 4. Drawer Locks: K&V drawer lock number 987NP.
 - 5. Pulls: EPCO AS53-108-SS (@ Base and Upper cabinets)
EPCO AS53-268-SS (@ Tall cabinets)
 - 6. Concealed Countertop Supports: RAKKS EH Countertop Support Bracket, clear anodized finish

2.04 MISCELLANEOUS

- A. Grommets for cable passage through countertops: 2" o.d. Black, molded plastic grommets with 1-1/2" hole and plastic cap with slot for wire passage.
- B. Quartz Countertops: Cambria, Whitney Matte - Signature

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Deliver cabinetwork to building completely assembled where possible. Where units are too large to pass through openings deliver partially assembled, after parts have been shop assembled for fit. Provide scribe pieces of sufficient length and width to fit wall and ceiling conditions. Anchor each unit in place using suitable devices.
- B. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level (including countertops); and with 1/16" maximum offset in flush adjoining surfaces, 1/8" maximum offsets in revealed adjoining surfaces.
- C. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.
- D. Anchor cabinetwork to anchors or blocking built-in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Use fine finishing nail for exposed nailings, countersunk and filled flush with woodwork, and matching final finish where transparent finish is indicated.
- E. Install cabinetwork without distortion so that doors and drawers will fit openings properly and be accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation.
- F. Anchor countertops securely to base units and other support systems as indicated.
- G. Complete the assembly of storage shelving and install in the areas indicated, including hardware and accessories as shown.
- H. Repair damaged and defective woodwork wherever possible to eliminate defects, functionally and visually; where not possible to repair properly, replace woodwork. Adjust joinery for uniform appearance.

END OF SECTION

SECTION 07 21 00 - BUILDING INSULATION

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. This Section includes the following:
 - 1. Concealed building insulation.
 - 2. Sound insulation.
 - 3. Exterior Continuous Insulation (outboard of the sheathing)
- B. Related Sections: The following Sections contain requirements that relate to this Section:

Section 09 21 16 - Gypsum Board Assemblies

1.03 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of insulation products specified.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

1.05 CODES AND STANDARDS

- A. Foam Plastic Insulation shall meet AFPC requirements as follows: AFPC V2 717.1.2, 717.2, 717.4.1.3, 717.4.1.4, 717.4.1.5.
- B. Insulating materials, concealed as installed shall have a flame spread rating of not more than 75 and a smoke developed rating of not more than 450. [AFPC V2 719.2.1] Insulating materials exposed as installed shall have a flame spread rating of not more than 25 and a smoke developed rating of not more than 450 [AFPC V2 719.3].

PART 2 - PRODUCTS

2.01 INSULATING MATERIALS

- A. General: Provide insulating materials that comply with requirements and with referenced standards.
 - 1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.
- B. Extruded-Polystyrene Board Insulation: Rigid, cellular polystyrene thermal insulation formed from polystyrene base resin by an extrusion process using hydrochlorofluorocarbons as blowing agent to comply with ASTM C 578 for type and with other requirements indicated below:
 - 1. Perimeter Insulation: Install in thickness referenced where shown on Drawings, including but not limited to, the outside face of all perimeter walls below grade.
- C. Kraft Faced Mineral-Fiber Blanket Insulation: Thermal insulation combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665, Type II, Class C with vapor-retarder membrane on 1 face.
 - 1. Mineral-Fiber Type: Fibers manufactured from glass.
 - 2. 3-1/2" thick with thermal resistance of R-13.
 - 3. 6-1/4" thick with thermal resistance of R-19.
 - 4. 8-1/2" thick with thermal resistance of R-25.
 - 5. 10-1/4" thick with thermal resistance of R-30.
 - 6. 13" thick with thermal resistance of R-38.
- D. Sound Attenuation Batts: Unfaced glass fiber acoustical insulation complying with ASTM C665, Type I, 3-1/2" thick or 6-1/4" x 16" wide x 96" long. Install sound batts in all interior metal stud walls separating occupied spaces from other occupied spaces including corridors and bathrooms. Batts to run full height of gypsum board applied to studs. All mechanical room walls shall have sound attention batts.
- E. Exterior Continuous Insulation: Owens-Corning FOAMULAR 250 - Rigid, cellular, polystyrene, thermal insulation with closed cells and integral high-density skin, formed by the expansion of polystyrene base resin in an extrusion process to comply with ASTM C 578, Type IV; in manufacturer's standard lengths and widths; and in thicknesses indicated.
- F. Spray-Foam Insulation: Johns Manville Corbond, closed and open-cell spray foam insulation reference Drawings for thicknesses indicated.

2.02 AUXILIARY INSULATING MATERIALS

- A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or that interfere with insulation attachment.

3.03 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, unsoiled, and has not been exposed at any time to ice and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

3.04 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Seal joints between closed-cell (non-breathing) insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
- C. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for firestopping. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.
- D. Install mineral-fiber blankets in cavities formed by framing members according to the following requirements:
 - 1. Use blanket widths and lengths that fill cavities formed by framing members. Where more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
 - 2. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

3.05 PROTECTION

- A. General: Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

BUILDING FOR ROGERS FACILITIES DEPARTMENT
ROGERS, AR

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DEMX ARCHITECTURE
FAYETTEVILLE, AR

SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Joint sealants for exterior and interior joints.
 - 2. Joint Backing.
- B. Related Sections: The following Sections contain requirements that relate to this Section:

Section 07 76 00 - Flashing and Sheet Metal
Section 07 84 00 - Firestopping
Section 08 81 00 - Glazing
Section 09 21 16 - Gypsum Board Assemblies

1.03 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.

1.04 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.
- B. Product data from manufacturers for each joint sealant product required.
- C. Selection Samples: Submit three color charts illustrating available sealant colors for Architect's initial selection.
- D. Verification Samples: Submit three samples of each color sealant selected in manufacturer's standard size.
- E. Manufacturer's Installation Instructions: Indicate surface preparation, special procedures, and conditions requiring special attention.

- F. Preconstruction Test Reports: Indicate which joint sealant and primer combinations resulted in satisfactory sealant adhesion to joint substrates. Indicate whether silicone sealants stained representative substrates.
- G. Qualifications Statements: For manufacturer and applicator.
- H. Warranties: Submit samples of manufacturer's warranties and final executed documents at Project closeout.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this Section and qualified by the manufacturer.

1.06 PRECONSTRUCTION TESTING

- A. Before installing sealants, arrange for sealant manufacturer to test each combination of sealant, substrate, and joint backing for adhesion and substrate staining.
 - 1. Allow sufficient time for testing and analyzing test results without delaying the Work.
 - 2. Deliver to manufacturer recommended number and sizes of substrate samples representative of those being installed.
 - 3. Report manufacturer's recommendations for satisfactory sealant adhesion including use of primers, substrate preparation techniques, or both.
 - 4. Testing is not required if manufacturer provides data showing previous testing, not older than 24 months, that indicates satisfactory adhesion and absence of staining.
- B. Adhesion Testing: Utilize ASTM C794 (laboratory), C 1521 (field), or both to determine whether primer is required for cured sealants to achieve an optimum bond to substrates.
- C. Stain Testing: Utilize ASTM C1248 to determine the potential of staining where silicone sealants contact stone and masonry substrates.

1.07 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 Installer's Warranty: Written warranty, signed by Installer agreeing to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period of 2 years from date of Substantial Completion.
- C. Special Manufacturer's Warranty: Written warranty, signed by elastomeric sealant manufacturer agreeing to furnish elastomeric joint sealants to repair or replace the

se that fail to achieve an airtight seal, watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Provide warranties of the following terms:

1. Silicone Sealants: 20 years; include coverage against staining porous materials.
2. Hybrid Sealants: 10 years.
3. Polyurethane Sealants: 5 years.
4. Acrylic Latex Sealants: 5 years.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.
- B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.
- C. Remove products that cannot be installed within their shelf life.

1.09 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:
 1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer or below 40° F.
 2. When joint substrates are wet.
- B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.
- C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- B. Sustainable Design Requirements:
 1. VOC Content: Provide joint sealants and sealant primers that comply with SCAQMD Rule 1168.

2. VOC Emissions: For products installed within the primary air barrier, provide joint sealants that have been tested per CDPH SM v1.1 or later.

2.02 ELASTOMERIC JOINT SEALANTS

- A. **[JS-01 -]** Exterior Building Joint Sealant: Single-component, Non-sag, Nonstaining, Ultra-Low Modulus, Neutral Moisture-curing, Silicone Sealant:
 1. Compliance: ASTM C 920, Type S, Grade NS, Class 100/50, Use NT, M, G, A, O.
 2. Performance: Dynamic movement capability of plus 100 percent and minus 50 percent per ASTM C 719.
 3. Color: As selected from manufacturer's standard range.
 4. Products:
 - a. Dow Corning 790.
 - b. Momentive Performance Products: SCS2700.
 - c. Pecora Corporation 890NST, 890FTS, or both.
- B. **[JS-02 -]** Concealed Metal Lap Joint Sealant: Single-component; Non-skinning, Non-hardening Butyl Sealant:
 1. Compliance: ASTM C 920, Type S, Grade NS, Class 50, Use T, NT, M, G, A, O.
 2. Performance:
 - a. Dynamic movement capability of 10 percent in extension and compression per ASTM C 719.
 - b. Reduces airborne sound transmission through perimeter joints and openings in building construction as determined per ASTM E 90 based on installation per ASTM C 919.
 3. Color: Gray.
 4. Products:
 - a. Bostic: ChemCalk 300.
 - d. Pecora Corporation: BA-98.
- C. **[JS-03 -]** Exterior Paving Joint Sealant: Single-component, Nonsag, Moisture-curing, Traffic Grade, Silyl-terminated Polyurethane (STPU) Sealant:
 1. Compliance: ASTM C 920, Type S, Grade P, Class 25, Use T, NT, M, A, O.
 2. Performance: Dynamic movement capability of plus 25 percent or minus 25 percent per ASTM C 719.
 3. Color: As selected from manufacturer's standard range.
 4. Products:
 - a. BASF MasterSeal SL-100.
 - b. Bostic: 955-SL.
 - c. Pecora Corporation Urexpan NR-201.
- D. **[JS-04 -]** Interior Joints at Exterior Wall: Single-component, Nonsag, Moisture-curing Silyl-terminated Polyurethane (STPU) Sealant:
 1. Compliance: ASTM C 920, Type S, Grade NS, Class 50, Use T, NT, M, G, A, O.
 2. Performance: Dynamic movement capability of plus 50 percent or minus 50 percent per ASTM C 719.
 3. Color: As selected from manufacturer's standard range.
 4. Products:

- a. Bostic: Pro-MS50.
 - b. Pecora Corporation: Dynatrol I-XL HYBRID.
- E. **[JS-05 -]** Interior Building Mildew-resistant Sealant : Single-component, Nonstaining, Low Modulus, Neutral-curing, Sanitary Silicone Sealant:
 - 1. Compliance: ASTM C 920, Type S, Grade NS, Class 50, Use NT, M G, A.
 - 2. Performance: Dynamic movement capability of plus 50 percent or minus 50 percent when tested in accordance with ASTM C 719.
 - 3. Color: As selected from manufacturer's standard range.
 - 4. Products:
 - a. Bostic: Bathroom 2700.
 - b. Momentive Performance Materials: SCS1700.
 - c. Pecora Corporation: 898NST.
- F. **[JS-06 -]** Interior Building Acoustical Sealant: Single-component, Siliconized Acrylic Latex Sealant; Acoustical; Paintable:
 - 1. Compliance: ASTM C 834, Type OP, Grade NF.
 - 2. Performance:
 - a. Dynamic movement capability of 7-1/2 percent in extension and compression per ASTM C 719.
 - b. Reduces airborne sound transmission through perimeter joints and openings in building construction as determined per ASTM E 90 based on installation per ASTM C 919.
 - 3. Color: White.
 - 4. Products:
 - a. Pecora Corporation: AC-20 FTR or AIS-919.
 - b. Tremco, Inc.: Smoke & Sound.
 - c. USG Corporation: Sheetrock Acoustical Sealant
- G. **[JS-07 -]** Interior Building Sealant: Single-component, Siliconized Acrylic Latex Sealant; Acoustical; Paintable:
 - 1. Compliance: ASTM C 834, Type OP, Grade NF.
 - 2. Performance: Dynamic movement capability of 7-1/2 percent in extension and compression per ASTM C 719.
 - 3. Color: White.
 - 4. Products:
 - a. American Sealants, Inc.: ASI-174.
 - b. Bostic: ChemCalk 600.
 - c. Pecora Corporation: AC-20+ Silicone.

2.03 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material and type that are non-staining; are compatible with joint substrates, sealants, primers and other joint fillers, and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

2.04 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from pre-construction joint sealant-substrate tests and field experience.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent nonporous surfaces.
- C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer and the following requirements:
 - 0. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 1. Clean concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
 - 2. Remove laitance and form release agents from concrete.
 - 3. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

5. Clean Exterior Insulation and Finish Systems (EIFS) using methods recommended by EIFS manufacturer.
- B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on pre-construction joint sealant-substrate tests or field experience. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.03 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
 1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.
- D. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed. Fill joints to a depth equal to 50% of joint width, but never more than 1/2" deep or less than 1/4" deep. Remainder of joint shall be filled with backer material.
 1. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer. Tool joints concave.

3.04 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.05 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that installations with repaired areas are indistinguishable from original work.

3.06 JOINT SEALANT SCHEDULE

- A. Provide joint sealant types in joint locations as scheduled below. Where Project sealant applications are not scheduled, make request to Architect.
- B. Exterior Traffic-bearing Joints in Concrete, Brick, and Stone Paving: Type JS-03.
- C. Exterior Weather Seal Joints in Vertical and Non-traffic-bearing Horizontal Surfaces: Type JS-01.
 - 1. Control and expansion joints.
 - 2. Perimeters of doors, windows, storefronts, curtain walls, and louvers.
 - 3. Joints between metal wall panels.
 - 4. Other exterior joints exposed to view.
- D. Exterior Metal Lap Joints: Type JS-02.
 - 1. Concealed joints in metal roofing.
 - 2. Concealed joints in metal siding.
 - 3. Other concealed exterior joints indicated.
- E. Interior Joints at Exterior Wall: Type JS-04.
 - 1. Vertical and non-traffic horizontal joints at juncture exterior wall and interior construction.
 - 2. Exposed control and expansion joints on interior of exterior wall assemblies.
 - 3. Perimeters of doors, windows, storefronts, curtain walls, louvers, and pipe/duct/electrical penetrations.
 - 4. Other interior joints indicated.
- F. Interior Joints in Concrete and Masonry: Type Type JS-04
 - 1. Exposed vertical control joints in concrete masonry partitions.
 - 2. Joints between gypsum board partitions and masonry or concrete.
 - 3. Other joints in or abutting interior concrete or masonry.
- G. Interior Mildew-resistant Joints: JS-5.
 - 1. Plumbing fixture perimeters.
 - 2. Joints in countertops.

3. Control and expansion joints in tile.
 4. Floor and wall joints in wet areas.
 5. Other interior wet area joints indicated.
- H. Interior Acoustical Joints: Type JS-06 or Type JS-02 (concealed joints).
1. Perimeters of acoustically-rated partitions and ceilings.
 2. Between wall surface and acoustical ceiling L-shaped perimeter trim.
 3. Perimeters of items penetrating acoustically-rated partitions and ceilings.
 4. Other interior acoustically-rated joints indicated.
- I. Interior Joints Where Little to No Movement is Expected: Type JS-06 or Type JS-07.
1. Perimeters of fire extinguisher cabinets, toilet accessories, grilles, registers, diffusers, and other items penetrating interior partitions and ceilings.
 2. Perimeter joints of door and borrowed light frames in interior partitions.
 3. Joints between interior partitions and countertops (dry areas).
 4. Interior joints for which another type of sealant is not indicated.
- J. Fire-resistive Joint Systems: See Section 07 84 00.

END OF SECTION

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SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Standard and custom hollow metal doors and frames.
- 2. Steel sidelight, borrowed lite and transom frames.
- 3. Light frames and glazing installed in hollow metal doors.

B. Related Sections:

- 1. Division 01 Section "General Conditions".
- 2. Division 08 Section "Flush Wood Doors".
- 3. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
- 4. Division 08 Section "Door Hardware".
- 5. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.
- 6. Division 28 Section "Access Control System".

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

- 1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
- 2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
- 3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
- 4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
- 5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
- 6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
- 7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- 8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
- 9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
- 10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.

11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.
- B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".
- C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40" above sill) or UL 10C.
 1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
 2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
 3. Smoke Control Door Assemblies: Comply with NFPA 105.
 - a. Smoke "S" Label: Doors to bear "S" label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.
- D. Fire-Rated, Borrowed-Light 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, based on testing according to NFPA 257. Provide labeled glazing material.
- E. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.
 - 1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.6 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.
- B. Building Information Modeling (BIM) Support: Utilize designated BIM software tools and obtain training needed to successfully participate in the Project BIM processes. All technical disciplines are responsible for the product data integration and data reliability of their Work into the coordinated BIM applications.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
- B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:
 - 1. CECO Door Products (C).
 - 2. Curries Company (CU).
 - 3. Steelcraft (S).

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 HOLLOW METAL DOORS

- A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.
- B. Exterior Doors: Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
 - 1. Design: Flush panel.
 - 2. Core Construction: Manufacturer's standard polystyrene. Where indicated, provide doors fabricated as thermal-rated assemblies with a minimum R-value of 2.8 or better.
 - 3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053-inch - 1.3-mm) thick steel, Model 2.
 - 4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
 - 5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
 - 6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
 - 1. Design: Flush panel.
 - 2. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.
 - a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
 - 3. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.

4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Manufacturers Basis of Design:

1. Curries Company (CU) - Polystyrene Core - 707 Series.

2.4 HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Frames: Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.
3. Manufacturers Basis of Design:

- a. Curries Company (CU) – M Series.

C. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
3. Manufacturers Basis of Design:

- a. Curries Company (CU) - CM Series.
- b. Curries Company (CU) - M Series.

D. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

E. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, 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 and not less than 0.042 inch thick.

- 3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.
- B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.
- C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.6 LIGHT OPENINGS AND GLAZING

- A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.
- B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.
- C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.
- D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

2.7 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.8 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. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.
- C. Hollow Metal Doors:
 - 1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
 - 2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.

3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" 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.
4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".

D. Hollow Metal Frames:

1. Shipping Limitations: 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.
2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 - a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.
3. 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.
4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
8. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
9. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. 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.
10. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
11. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance

with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.

- E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
 - 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 - 2. Reinforce doors and frames to receive non-template, 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 Division 26 Sections.

2.9 STEEL FINISHES

- A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

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. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded in shipping spreaders installed at 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 square, level, twist, and plumb condition.

- C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.
- E. Verify tolerances against manufacturers installations instructions for tornado and hurricane storm shelter openings.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.
 - 1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
 - 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
 - 4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
 - 1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
 - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

3.5 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
 - 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

END OF SECTION 081113

SECTION 08 14 16 - FLUSH WOOD DOORS

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. This Section includes: Factory finished solid core doors with wood-veneer faces.
- B. Related section includes:

Section 08 11 13 - Hollow Metal Doors and Frames
Section 08 71 00 - Door Hardware
Section 08 81 00 - Glazing

1.03 SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction, trim for openings, and louvers.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data, including fire rating and locations of cutouts.

1.04 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.
- B. Quality Standard: Comply with AWI Quality Standard: AWI's "Architectural Woodwork Quality Standards" for grade of door, core, construction, finish, and other requirements.
- C. Fire-Rated Wood Doors: Doors 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 according to NFPA 252. Test Pressure at atmospheric pressure.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect doors during transit, storage, and handling to prevent damage, soiling, and deterioration. Comply with requirements of referenced standard and manufacturer's written instructions.

- B. Mark each door with individual opening numbers used on Shop Drawings. Use removable tags or concealed markings.

1.06 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet-work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during remainder of construction period.

1.07 WARRANTY

- A. General Warranty: Door manufacturer's warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Door Manufacturer's Warranty: Submit two copies of written agreement on door manufacturer's standard form, signed by manufacturer, Installer, and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup, or twist) more than 1/4" in a 42-by-84" section or that show telegraphing of core construction in face veneers exceeding 0.01" in a 3" span, or do not comply with tolerances in referenced quality standard.
 - 1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 2. Warranty shall be in effect during the following period of time after the date of Substantial Completion: Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - Masonite Architectural
 - VT Industries

2.02 DOOR CONSTRUCTION, GENERAL

- A. All Solid Core Doors Shall be or match VT Industries, Heritage Collection, White Maple.
- B. Solid Core Doors for Transparent Finish: Comply with the following requirements:
 - 1. Grade: Premium (Grade A faces).
 - 2. Faces: White Maple, Plain-Sliced. Bookmatched and running match. Provide pair match at pairs of doors. Color to be selected by Architect.
 - 3. Stiles: Applied wood edges of same species as faces and covering edges of faces.

4. Construction: PC-5 (5-ply, ANSI A208.1 LD-2 particleboard core), or SLC-5 (5-ply, glued block core), at Contractor's option
 5. Particleboard: ANSI A208.1, Grade LD-2.
 6. Blocking: Provide wood blocking at particleboard-core doors as follows:
 - a. 5" top-rail blocking, at doors indicated to have closers.
 - b. 8-1/4" bottom-rail blocking, at doors indicated to have kick, mop, or armor plates.
 - c. 5" midrail blocking, at doors indicated to have exit devices.
 7. Doors shall be factory finished.
- C. Fire-Rated Doors: Comply with the following requirements:
1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as required to provide fire rating indicated.
 2. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated.
 - a. 5" top-rail blocking.
 - b. 8-1/4" bottom-rail blocking, at doors indicated to have kick, mop, or armor plates.
 - c. 4-1/2 x 10" lock blocks.
 - d. 5" midrail blocking at doors indicated to have exit devices.
 3. Edge Construction: At hinge stiles, provide manufacturer's standard laminated-edge construction with improved screw-holding capability and split resistance and with outer stile matching face veneer.
 4. Pairs: Provide fire-rated pairs with fire-retardant stiles that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals.
 5. Doors shall be factory finished.

2.03 LOUVERS AND LIGHT FRAMES

- A. Metal Louvers: As specified in Division 23 and shown on mechanical drawings.
- B. Metal Frames for Light Openings in Fire Doors: Manufacturer's standard frame formed of 0.0478" thick, cold-rolled steel sheet, factory primed and approved for use in doors of fire rating indicated. Paint frames as directed by Architect.

2.04 FABRICATION

- A. Fabricate flush wood doors in sizes indicated for Project site fitting.
- B. At Contractor's option, he may furnish factory fit doors to suit frame-openings sizes indicated. He shall comply with clearance requirements of referenced quality standard for fitting. Comply with requirements of NFPA 80 for fire-rated doors.

- C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining. Pre-machine metal astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- D. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required. At light openings - trim openings with moldings of material and profile indicated.

2.05 FACTORY FINISHING

- A. Comply with referenced quality standards requirements for factory finishing and finish wood doors at factory.
- B. Provide finish per drawings.
- C. Transparent Finish: Comply with requirements for grade, finish system, staining effect, and sheen.
 - 1. Grade: Custom.
 - 2. Finish: WDMA System TR-8 and AWS System 12
 - 3. Staining: Match approved sample for color.
 - 4. Effect: Filled finish.
 - 5. Sheen: Satin.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine installed door frames before hanging doors. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Hardware: For installation, see Division 8 Section "Door Hardware."
- B. Manufacturer's Written Instructions: Install wood doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- C. Job-Fit Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.

1. Clearances: Provide 1/8" at heads, jambs, and between pairs of doors. Provide 3/4" at bottom of door. Where threshold is shown or scheduled, provide 1/4" from bottom of door to top of threshold. Comply with NFPA 80 for fire-rated doors.
2. Bevel non-fire-rated doors 1/8" at lock and hinge edges.
3. Bevel fire-rated doors 1/8" in 2" on lock edge; trim stiles and rails only to extent permitted by labeling agency.

3.03 ADJUSTING AND PROTECTING

- A. Operation: Re-hang or replace doors that do not swing or operate freely.
- B. Finished Doors: Refinish or replace doors damaged during installation.
- C. Protect doors as recommended by door manufacturer to ensure that wood doors are without damage or deterioration at the time of Substantial Completion.

END OF SECTION

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SECTION 08 41 00 - ALUMINUM DOORS, WINDOWS AND FRAMES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 DESCRIPTION

- A. Furnish all material, labor, equipment and services necessary to install the aluminum windows and storefront, anchors, hardware, and related items indicated on the Drawings. In general, the work includes: Fixed aluminum storefront frames, doors and hardware, and windows.

1.03 WORK SPECIFIED ELSEWHERE

Section 07 92 00 - Joint Sealants
Section 08 11 13 - Hollow Metal Doors and Frames
Section 08 81 00 - Glazing

1.04 SUBMITTALS

- A. Prior to start of fabrication submit shop drawings to Architect for approval.
- B. Drawings shall indicate location of windows, opening dimensions and details of head, jamb and sill at each opening.

1.05 WARRANTY

- A. Project Warranty: Refer to "Conditions of the Contract" for project warranty provisions.
- B. Manufacturer's Product Warranty: Submit, for Owner's acceptance, manufacturer's warranty for storefront system as follows:
 - 1. Warranty Period: Two (2) years from Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no event later than six months from date of shipment.
 - 2. Manufacturer's Door Product Warranty: Submit, for Owner's acceptance, manufacturer's warranty for door/entrance system as follows:
Warranty Period: Two (2) years from Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no event later than six months from date of shipment. In addition, welded door corner construction shall be supported with a **LIMITED LIFETIME WARRANTY** for the life of the door under normal use.
See items 2.01, item C below for door construction.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All door, window and framing systems shall be Architectural Class I anodized finish (AA-M10C21A44) unless noted otherwise. Color # 29, Black.
- B. Kawneer TRIFAB 451T, exterior framing system, or equal. Provide accessory parts, shapes and brake metal as required for a complete installation. Storefront System – 2" x 4-1/2" nominal dimension; Thermal, **Center** Set-Glazed, Shear Block Fabrication.
- C. Kawneer TRIFAB 450, interior framing system, or equal. Provide accessory parts, shapes and brake metal as required for a complete installation. Storefront System – 1-3/4" x 4-1/2" nominal dimension; Non-Thermal, **Center** Set-Glazed, Shear Block Fabrication.
- D. Doors to be Kawneer, 350 Medium Style door, or equal, of sizes shown on the Drawings with optional 10" Bottom Rail and with vertical and horizontal intermediate rails as shown on Drawings. Supply closers and thresholds where required. Bottoms and edges of doors shall be weather stripped with a full width metal bound, replaceable pile weather stripping.
 - 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 OF 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
- E. Substitutions:
 - 1. General: Refer to Substitutions Section for procedures and submission requirements.
 - 1. Pre-Contract (Bidding Period) Substitutions: Submit written requests ten (10) days prior to bid date.
 - 2. Substitution Documentation
 - a. Product Literature and Drawings: Submit product literature and drawings modified to suit specific project requirements and job conditions.
 - b. Certificates: Submit certificate(s) certifying substitute manufacturer (1) attesting to adherence to specification requirements for storefront system performance criteria, and (2) has been engaged in the design, manufacturer and fabrication of aluminum storefront for a period of not less than ten (25) years.
 - 3. Samples: Provide samples of typical product sections and finish samples in manufacturer's standard sizes.
 - 4. Substitution Acceptance: Acceptance will be in written form, either as an

addendum or modification.

- F. All exposed screws to be tamper proof.
- G. Hardware: Furnish and install hardware as follows for each Kawneer Door: Cylinders shall be subject to change construction master, building master and grand master keys as specified in Section 08 71 00 – Door Hardware. See Hardware Schedule for remainder of hardware.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Comply with manufacturer's recommendations for the installation of aluminum doors, door frames and windows.
- B. Set units plumb, level and true to line without warp or rack of frames and doors. Anchor securely in place. Separate dissimilar metals with bituminous coatings or preformed separators.
- C. Set sill members and other members in a bed of compound to provide weather tight construction. Provide aluminum subsills where shown on Drawings.
- D. Obtain actual job site dimensions of each masonry opening and fabricate to fit with clearances indicated on the Drawings.
- E. Provide each continuous unit of framework, doors, sidelights, hardware and all accessory items as a packaged unit. Complete the fabrication, assembly and finishing before shipment to the project site to the greatest extent possible.
- F. Complete the cutting, fitting, forming, drilling and grinding of all metal work prior to cleaning, finishing, treatment and application of coatings.
- G. Weld by methods recommended by the manufacturer and AWS to avoid discoloration at welds. Grind exposed welds smooth and restore mechanical finish. Remove arises from cut edges and ease edges and corners to a radius of approximately 1/64".
- H. Conceal fasteners wherever possible. Joints shall be drawn up to an invisible or hair line crack. Exposed fasteners shall be flush with finished surface of the member.

- I. Reinforce the work, as necessary, for performance requirements and for support to the system. Provide separators which will prevent corrosion. Provide cutouts and concealed reinforcement shall be equal to 3/16" thick steel straps.

3.02 CLEANING

- A. Cleaning: Remove temporary coverings and protection of adjacent work areas. 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.
- B. Protection: Protect installed product's finish surfaces from damage during construction. Protect aluminum entrances from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants. Remove and replace damaged aluminum entrances at no extra cost.

END OF SECTION

SECTION 087100
DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hardware for wood, aluminum, and hollow metal doors.
- B. Hardware for fire-rated doors.
- C. Lock cylinders for doors with balance of hardware specified in other Sections.
- D. Thresholds.
- E. Smoke and draft control seals.
- F. Weatherstripping and gasketing.

1.02 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry
- B. Section 079200 - Joint Sealants
- C. Section 081113 - Hollow Metal Doors and Frames
- D. Section 081416 - Flush Wood Doors.
- E. Section 081423.16 - Plastic Laminate-Faced Wood Doors.
- F. Section 084113 - Aluminum-Framed Entrances and Storefronts
- G. Section 084313 - Aluminum-Framed Storefronts
- H. Section 099000 - Painting and Coating

1.03 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.
- C. BHMA A156.1 - Standard for Butts and Hinges; 2021.
- D. BHMA A156.2 - Bored and Preassembled Locks and Latches; 2022.
- E. BHMA A156.3 - Exit Devices; 2020.
- F. BHMA A156.4 - Door Controls - Closers; 2019.
- G. BHMA A156.5 - Cylinders and Input Devices for Locks; 2020.
- H. BHMA A156.6 - Standard for Architectural Door Trim; 2021.
- I. BHMA A156.7 - Template Hinge Dimensions; 2016.
- J. BHMA A156.8 - Door Controls - Overhead Stops and Holders; 2021.
- K. BHMA A156.13 - Mortise Locks & Latches Series 1000; 2022.
- L. BHMA A156.16 - Auxiliary Hardware; 2018.
- M. BHMA A156.18 - Materials and Finishes; 2020.
- N. BHMA A156.21 - Thresholds; 2019.
- O. BHMA A156.22 - Standard for Gasketing; 2021.
- P. BHMA A156.26 - Standard for Continuous Hinges; 2021.
- Q. BHMA A156.28 - Standard for Recommended Practices for Mechanical Keying Systems; 2018.
- R. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2016.
- S. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames; 2006.

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- T. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- U. ITS (DIR) - Directory of Listed Products; Current Edition.
- V. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.
- W. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2022.
- X. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.
- Y. UL (DIR) - Online Certifications Directory; Current Edition.
- Z. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- AA. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.
- BB. Door And Hardware Institute (DHI) Publications:
 - 1. DHI TDH-003-20 - Sequence and Format for the Hardware Schedule; 2019.
 - 2. DHI TDH-004-20- Keying Systems and Nomenclature; 2019.
 - 3. DHI TDH-009-20 - Recommended Locations for Architectural Hardware for Doors Installed in Standard Steel Frames; Updated 2020.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on. Coordinate with blocking and reinforcement requirements for the required hardware with the corresponding door and frame manufacturers prior to fabrication.
- B. Coordinate blocking and reinforcement requirements for the required wall-mounted hardware prior to erecting walls.
- C. Sequence installation to ensure facility services connections are achieved in an orderly and expeditious manner.
- D. Preinstallation Meeting:
 - 1. Convene a preinstallation meeting one week prior to commencing work of this Section.
 - 2. Require attendance by personnel of related trades, installers, and the following:
 - a. Architect.
 - b. Contractor
 - c. Hardware Supplier's Architectural Hardware Consultant (AHC).
 - d. Hardware Installer.
 - 3. Review installation details and requirements for hardware items.
 - 4. Review coordination details.
 - 5. Identify which hardware that is furnished without fastener holes and will require drilling and countersinking to be performed by the installer.
- E. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.
- F. Keying Requirements Meeting:
 - 1. Arrange for a keying meeting, with Architect, Owner and hardware supplier, and other involved parties to ensure locksets and locking hardware, are functionally correct and keying complies with project requirements.
 - 2. Attendance Required:
 - a. Contractor.
 - b. Owner.
 - c. Architect.
 - d. Architectural Hardware Consultant (AHC).
 - 3. Furnish three (3) copies of the approved Schedule of Locks and Cylinders to guide the meeting.
 - 4. Agenda:
 - a. Establish keying requirements.

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- b. Verify locksets and locking hardware are functionally correct for project requirements.
- c. Verify that keying and programming complies with Project requirements.
- d. Establish keying submittal schedule and update requirements.
- 5. Incorporate Owner's keying instructions and directives established at the Keying Requirements Meeting into keying submittal including, but not limited to, the following:
 - a. Key control system requirements.
 - b. Schematic diagram of preliminary key system.
- 6. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
- 7. Deliver the Owner-approved Keying Schedule to the permanent core manufacturer.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.
- C. Shop Drawings:
 - 1. Door Hardware Schedule
 - a. Submit a detailed listing that includes each item of hardware to be installed on each door.
 - b. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
 - c. Comply with DHI TDH-003-20 using door numbering scheme and hardware set numbers as indicated in Contract Documents.
 - d. Arrange hardware details, opening details and headings in vertical schedule format.
 - e. List groups and suffixes in proper sequence.
 - f. Include complete description for each door listed.
 - g. Include manufacturers names, product names, catalog numbers. Include functions, types, styles, sizes and finishes of each item.
 - h. Include account of abbreviations and symbols used in schedule.
 - i. Note which hardware that is furnished without fastener holes and will require drilling and countersinking to be performed by the installer.
 - 2. Keying:
 - a. Submit a schedule of locks and cylinders with the hardware schedule. Schedule of locks and cylinders shall comply with the following:
 - 1) Submit schedule of openings that receive locks and cylinders. Include the following information according the Drawings:
 - (a) Column 1: Opening No.
 - (b) Column 2: Opening Location.
 - 2) The schedule shall also contain the following empty columns which shall be reviewed and filled in at the Keying Meeting:
 - (a) Column 3: Core Mark/Key Set.
 - (b) Column 4: Key Quantity.
 - (c) Column 5: Keyway
 - b. Keying Schedule:
 - 1) Furnish keying information in compliance with DHI TDH-004-20 standards.
- D. Samples for Verification
 - 1. Promptly after receipt of approved Hardware Schedule, submit samples of the following to represent compliance with specified requirements, style, color, and finish:
 - a. Full size samples:
 - 1) Conventional Hinges
 - 2) Locksets
 - 3) Closers:
 - (a) Cam-Action Type.

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- (b) Rack-and-Pinion Type
 - 4) Exit Devices
 - 5) Exit Device Trims
 - b. Minimum 2-inch by 4-inch sheet samples:
 - 1) Protection Plates
 - c. Minimum length of 12 inches for the following products:
 - 1) Continuous Hinges
 - 2) Drip Caps
 - 3) Weatherstripping
 - 4) Gasketing
 - 5) Door Bottom Seals
 - 6) Thresholds
 - 2. Retain approved samples at the Project site. Turnover approved samples to Owner at Substantial Completion with Operation and Maintenance Manual.
 - 3. Include product description with samples.
- E. Informational Submittals:
- 1. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
 - 2. Manufacturer's qualification statement.
 - 3. Installer's qualification statement.
 - 4. Supplier's qualification statement.
 - 5. Glass Door Exit Devices: Check opening by accurate field measurement before fabrication. Show recorder measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of the work and possible damage to the finished product.
- F. Closeout Submittals—Furnish the following in compliance with 017800 - Closeout Submittals:
- 1. Approved Hardware Schedule with as-installed details noted.
 - 2. Product data and maintenance data for installed hardware—Include the following:
 - a. Manufacturer's printed instructions for installation, adjusting, troubleshooting, repair, and assembly/disassembly/reassembly, routine procedures for preventative maintenance,
 - b. Manufacturer's data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
 - c. Manufacturer's parts lists and templates.
 - 3. AHC's inspection reports consisting of the following:
 - a. Date of inspections
 - b. Facility name and address
 - c. Company name and address of inspecting company
 - d. Verification of visual inspection and functional operation of door openings with builder's hardware.
 - e. Itemized list of product deficiencies with corresponding opening number and manufacturer's product number. Include date of follow-up inspection and AHC's certification when deficiencies are corrected.
 - f. List of openings in compliance with Project requirements.
 - g. Identify openings with Architect's door number.
 - h. Identify fire-rated doors with rating of protection expressed in minutes.
 - i. Name and signature of AHC performing inspections.
 - 4. Owner-Approved Key Schedule.
 - 5. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
 - 6. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.
 - 7. Maintenance Materials and Tools:

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- a. Furnish the following for Owner's use in maintenance of project:
 - 1) Manufacturer's tools for use with mortise locksets:
 - (a) Cylinder wrench: Tool for installing, removing, and testing cylinders.
 - (b) Spanner wrench: Tool for installing sectional trim.
 - (c) Allen wrench: Tool for installing and removing inside levers.
 - (d) Emergency access keys for privacy locksets.
 - 2) Manufacturer's tools for use with cylindrical locksets:
 - (a) Spring loading tool.
 - (b) Spanner wrench: Tool for removing inside levers and inside rose.
8. See Section 017800 - Closeout Submittals for additional provisions.

1.06 QUALITY ASSURANCE

- A. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by Architect and Contractor.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.
- D. Supplier Qualifications:
 1. The permanent employees must include at least one Architectural Hardware Consultant (AHC) currently certified by the Door and Hardware Institute (DHI).
 2. The supplier's AHC shall be available during normal working hours for hardware consultation to the Owner, Architect, and Contractor.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.
- B. Permanent Cores and Keys: Deliver keys and cores with identifying tags to Owner by security shipment direct from manufacturer.

1.08 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide manufacturer warranty against defects in material and workmanship for period indicated, from Substantial Completion. Complete forms in Owner's name and register with manufacturer.
 1. Closers: Five years, minimum.
 2. Exit Devices: Three years, minimum.
 3. Locksets and Cylinders: Three years, minimum.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.
- B. Provide individual items of single type, of same model, and by same manufacturer.
- C. Locks: Provide a lock for each door, unless it's indicated that lock is not required.
 1. Lock Function:
 - a. Provide lock and latch function numbers and descriptions of manufacturer's series as indicated in Hardware Sets.
 - b. Provide an office lockset for swinging doors for which a lock function is not indicated.
 - c. Provide privacy function mortise locksets with visual indicators for doors serving the following rooms:
 - 1) Single occupant restrooms.
 - 2) Family toilets and bathing rooms.

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- 3) Assisted-use toilets and bathing rooms.
2. Trim: Provide lever handle on both sides of each lock, unless otherwise indicated.
3. Strikes:
 - a. Finish: To match lock or latch.
 - b. Strike Lip:
 - 1) Single Door Openings:
 - (a) Curved lip
 - (b) Lip-to-center (LTC) dimension of sufficient length that minimally clears frame trim.
 - (c) Extra-Long-Lip Strikes: Provide for locks used on frames with applied wood casing trim.
 - 2) Pair Door Openings:
 - (a) Flat lip
 - (b) 7/8-inch LTC for 1-3/4 thick inactive leaf.
 - c. Frame Strike Box: Provide strike box fabricated for use with aluminum framing, wood inactive leaves, and frames not manufactured with a strike box.
 - d. Center Strike at Pairs of Doors: Flat lip, 7/8-inch LTC.
 - e. Strikes for locksets at new frames shall be 4-7/8 inches tall except where noted otherwise.
- D. Door Pulls and Push Plates:
 1. Provide a pair of pulls where back-to-back BTB mounting is indicated.
 2. On glazed storefront doors, provide matching door pulls/push plates on both faces unless otherwise indicated.
- E. Closers:
 1. Provide door closer on each exterior door, unless otherwise indicated.
 2. Provide door closer on each fire-rated and smoke-rated door.
 3. Spring hinges are not an acceptable self-closing device, unless otherwise indicated.
- F. Overhead Stops and Holders (Door Checks):
 1. Provide swinging doors with overhead stops. Omit overhead stop where door opening is specified with one or more of the following items:
 - a. Floor stop.
 - b. Spring-stop arm assembly.
 - c. Wall stop.
- G. Drip Guards: Provide at head of outswinging exterior doors unless protected by roof or canopy directly overhead.
- H. Thresholds:
 1. Exterior Applications: Provide at each exterior door, unless otherwise indicated.
- I. Smoke and Draft Control Seals:
 1. Provide gasketing for 20-minute fire-rated doors and for smoke-and-draft control doors that complies with local codes, requirements of assemblies tested in accordance with UL 1784.
- J. Weatherstripping and Gasketing:
 1. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated.
 2. Provide door bottom sweep on each exterior door, unless otherwise indicated.
 3. Fabricate as continuous gasketing, do not cut or notch gasketing material.
- K. Fasteners:
 1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
 2. Aluminum fasteners are not permitted.
 3. Screw Drives:

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- a. Provide Phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
- b. Provide tamper resistant fasteners 6-lobe, Torx, and Spanner for electric hardware.
- c. The following are drives are acceptable as tamper-resistant:
 - 1) 6-lobe
 - 2) Torx
 - 3) Spanner
4. Fasteners shall be finished to match corresponding door hardware.
5. Provide machine screws for attachment to reinforced hollow metal and aluminum frames.
6. Self-drilling (Tek) type screws are not permitted.
7. Provide stainless-steel machine screws and lead expansion shields for concrete and masonry substrates.
8. Provide wall grip inserts for hollow wall construction.
9. Surface Mounted Hardware: Unless otherwise noted, fasteners are to be concealed.
10. Fire-Resistance-Rated Applications:
 - a. Comply with NFPA 80.
 - b. Comply with the fire-rated products manufacturers' UL10C listings for the specified rating and hardware configuration.
 - c. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.
 - d. Where doors are not adequately blocked and reinforced, provide steel through bolts for attachment of surface mounted closers, hinges, and exit devices to door panels where proper door blocking is not provided.
 - e. Provide frame-applied intumescent seals and gasketing for fire-rated UL10C Category B doors.

2.02 PERFORMANCE REQUIREMENTS

- A. Provide door hardware products that comply with the following requirements:
 1. Applicable provisions of federal, state, and local codes.
 2. Accessibility: ADA Standards and ICC A117.1.
 3. Fire-Resistance-Rated Doors: Provide hardware compliant with NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
 4. Hardware on Fire-Resistance-Rated Doors: Listed and classified by UL (DIR) or ITS (DIR) as suitable for application indicated.
 5. Hardware for Smoke and Draft Control Doors (Indicated as "S" on Drawings): Provide door hardware that complies with local codes, and requirements of assemblies tested in accordance with UL 1784.
 6. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
 7. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.
 8. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified.

2.03 BUTT HINGES

- A. Manufacturers:
 1. BEST; dormakaba Group: www.bestaccess.com.
- B. Properties:
 1. Butt Hinges:
 - a. Template screw hole locations.
 - b. Bearings:
 - 1) Standard Weight (SW) Hinges: Minimum of two (2) permanently lubricated non-detachable bearings.
 - 2) Heavy Weight (HW) Hinges: Minimum of four (4) permanently lubricated bearings on heavy weight hinges.

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- 3) Bearing assembly installed after plating.
 - 4) Exposed fully hardened bearings.
 - 5) Bearing Shells: Shapes consistent with barrels.
 - c. Pins:
 - 1) Easily seated, non-rising pins.
 - 2) Fully plate hinge pins.
 - 3) Non-Removable Pins: Slotted stainless-steel screws.
 - d. UL 10C listed and NFPA 80-compliant for use on fire-rated doors.
- C. Widths:
 - 1. As required to clear surrounding trim.
 - 2. Sufficient size to allow 180-degree swing of door.
- D. Finishes:
 - 1. Comply with BHMA A156.18 requirements for the finishes identified in Hardware Sets.
 - 2. Fully polish steel hinges prior to plating; front, back, and barrel.
- E. Grades:
 - 1. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.
 - 2. Comply with BHMA A156.18 Materials and Finishes.
- F. Material:
 - 1. Provide steel hinges except as follows:
 - a. Interior non-rated doors serving wet locations, humid locations, and non-conditioned spaces: Provide hinges with brass or bronze base material.
 - b. Interior fire-rated doors serving wet locations, humid locations, and non-conditioned spaces: Provide steel hinges with rust resisting base (K).
 - c. Exterior non-rated doors: Provide hinges with brass or bronze base material.
 - d. Exterior fire-rated doors: Provide steel hinges with rust resisting base (K).
- G. Types:
 - 1. Butt Hinges: Include full mortise hinges.
- H. Other Requirements:
 - 1. Butt hinges shall have non-removable pins (NRP). Omit NRP feature from hinges at the following doors:
 - a. Doors equipped with passage locksets and passage exit device trim functions.
 - b. Inswinging doors.
- I. Quantities: Three (3) hinges per leaves up to 90 inches in height. Add one (1) for each additional 30 inches in height or fraction thereof.
- J. Sizes:
 - 1. Minimum hinge weight, thickness and height according to the following door sizes:
 - a. For doors up to 36 inches wide and up to 1-3/4 inches thick provide hinges with a minimum thickness of 0.134-inch and a minimum of 4-1/2 inches in height.
 - b. For doors from 36 inches wide up to 42 inches wide and up to 1-3/4 inches thick provide hinges with a minimum thickness of 0.145-inch and a minimum of 4-1/2 inches in height.
 - c. For doors from 42 inches wide up to 48 inches wide and up to 1-3/4 inches thick provide hinges with a minimum thickness of 0.190-inch and a minimum of 5 inches in height.
 - d. For doors greater than 1-3/4 inches thick provide hinges with a minimum thickness of 0.190-inch and a minimum of 5 inches in height.
- K. Approved Products:
 - 1. Butt Hinges:
 - a. Ball Bearing, Five (5) Knuckle:
 - 1) Brass, Bronze HW Hinges:
 - (a) BEST: FBB199

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- 2) Brass, Bronze SW Hinges:
 - (a) BEST: FBB191
- 3) Steel HW Hinges:
 - (a) BEST: FBB168
- 4) Steel SW Hinges:
 - (a) BEST: FBB179

2.04 CONTINUOUS HINGES

- A. Manufacturers:
 - 1. BEST; dormakaba Group.
- B. Properties:
 - 1. Geared Continuous Hinges
 - a. Non-handed.
 - b. Anti-spinning through-fastener.
 - c. UL 10C listed for fire-resistance-rated doors:
 - 1) Metal Door Installation:
 - (a) Rated up to 90 minutes without fire studs.
 - (b) Provide fire studs for fire rating greater than 90 minutes.
 - 2) Wood Door Installation:
 - (a) Rated up to 60 minutes without fire studs.
 - (b) Provide fire studs for fire rating greater than 60 minutes.
 - 3) Fire studs shall be stainless steel. Provide in compliance with the manufacturer's UL10C listing for the indicated rating and door height.
- C. Finishes:
- D. Grades:
 - 1. Continuous Hinges: Comply with BHMA A156.26, Grade 1.
- E. Material:
 - 1. Gear Hinges: 6063-T6 aluminum.
- F. Types:
 - 1. Include geared, edge mounted hinges.
- G. Quantities: One per door leaf.
- H. Sizes:
 - 1. Widths:
 - a. As required to clear surrounding trim.
 - b. Sufficient size to allow 180-degree swing of door.
 - 2. Length: 1-inch less than door height (LDH).
- I. Other Requirements:
 - 1. Provide hinges lead lined (LL) model for the following door types:
 - a. Lead lined doors
 - b. Doors weighing more than 450 pounds up to 1,000 pounds.
 - 2. Provide continuous hinges with anti-vandal bearing at the top of the hinge to prevent passage of destructive objects into the gears (SO).
 - 3. Where door receiving continuous hinge is also receiving a mortise or concealed automatic door bottom, prepare the bottom of the door hinge leaf according to the door bottom manufacturer's template for the corresponding door bottom (ADB).
- J. Products—Provide 1-3/4 inches thick swinging doors with approved aluminum geared hinges according to door material. Provide continuous hinges according to door inset condition as follows:
 - 1. No inset, flush with frame:
 - a. BEST: 661HD
 - 2. 3/32" inset:

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- a. BEST: 671HD
- 3. 1/8" inset:
 - a. BEST: 667HD

K. Provide BEST model # 672HD for 2 inches thick doors.

2.05 BOLTS

- A. Manufacturers:
 - 1. ABH: www.abhmfg.com.
- B. Fire-Rating: At fire rated doors, provide products certified by UL to UL10C, complying NFPA 80 and NFPA 252 for the indicated fire rating.
- C. Provide products compatible with the corresponding door material.
- D. Properties:
 - 1. Flush Bolts:
 - a. Provide flush bolts centered in the lock edge of inactive leaf of pair door openings. Provide flushbolt type specified and according to the following types:
 - 1) Self-Latching Flush Bolts:
 - (a) Automatically latching upon closing of door
 - (b) Manually retracted top bolt
 - (c) Automatically retracting bottom bolt upon opening the active leaf.
 - (d) Bolt Throws: 3/4 inch, minimum.
 - 2. Dustproof Strikes: Provide for bottom bolt to allow bolting into floor and metal thresholds.
- E. Other Requirements:
 - 1. Extension Bolts: In leading edge of door, one bolt into floor, one bolt into top of frame.
 - 2. Lever extensions:
 - a. Rod length shall be 12 inches minimum.
 - b. Top rod shall have sufficient length to accommodate locating the flushbolt 72 inches AFF to centerline.
 - 3. Omit bottom bolts where noted in the Hardware Sets.
 - 4. Where bottom bolt is omitted at fire-rated doors, provide manufacturers fire bolt compliant with the indicated rating.
- F. Approved Products:
 - 1. Self-Latching Flushbolt:
 - a. Metal Doors:
 - 1) ABH: 1863
 - b. Wood Doors:
 - 1) ABH: 1873
 - 2. Dustproof Strike:
 - a. ABH: 1870
 - 3. Fire Bolt:
 - a. ABH: 1858

2.06 EXIT DEVICES

- A. Manufacturers:
 - 1. BEST, dormakaba Group: www.bestaccess.com/.
- B. Properties:
 - 1. Actuation Type: Comply with BHMA A156.3 push pad requirements.
 - 2. Chassis:
 - a. The chassis is constructed from investment cast steel, zinc dichromated.
 - b. Center chassis of concealed cervical rod devices are Steel plated, heavy wrought Steel Assembly with lock in place Top and Bottom Latch Adjustors. Adjustment is accessible through the door after installation.

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- c. Chassis of other devices are constructed from investment cast steel, zinc dichromated.
 - d. Compatibility:
 - 1) Door Face: Provide exit devices according to lock stile width.
 - 2) Handing: As indicated on Drawings.
 - 3) Door Thickness: As indicated on Drawings.
 - 4) Door moldings: Provide devices with shim kits to raise the device from the door surface to accommodate glass light molding and door trim.
 - 5) Function: Provide exit devices compatible with the function and trim specified in the Hardware Sets.
 - 3. Size:
 - a. The actuating portion of the releasing device shall extend not less than one-half of the door leaf width.
 - b. Provide vertical rod devices of sufficient length according to the door height indicated on Drawings.
 - c. Provide exit devices and exit device trims to fit the corresponding door thickness.
 - 4. Touchpads:
 - a. T-style metal touchpads and rail assemblies with matching chassis covers end caps.
 - 5. Latch Bolts: Stainless-steel deadlocking with 3/4 inch projection using latch bolt.
 - 6. Lever Design: Match project standard lockset trims.
 - 7. Cylinders:
 - a. Include for cylinder for cylinder dogging (CD) and for locking trims. Cylinders shall be compatible with the required permanent key system.
 - b. Provide cylinders with keyed SFIC temporary construction cores.
 - 8. Strike as recommended by manufacturer for application indicated.
 - 9. Sound dampening on touch bar.
 - 10. Dogging:
 - a. Non-Fire-Resistance-Rated Devices:
 - 1) Cylinder Dogging (CD) unless otherwise noted.
 - 2) Provide exit devices less dogging (LD) where specified in the Hardware Sets.
 - b. Fire-Resistance-Rated Devices: Manual dogging not permitted.
 - 11. Touch bar assembly on wide stile exit devices to have a 1/4 inch clearance to allow for vision frames.
 - 12. All exposed exit device components to be of architectural metals and true architectural finishes.
 - 13. Handing: Field-reversible.
 - 14. Conceal fasteners on back side of device channel.
 - 15. Vertical Latch Assemblies' Operation: Gravity, without use of springs.
 - a. Latch Bolts: Stainless-steel, with 3/4-inch-throw.
- C. Grades:
- 1. Comply with BHMA A156.3, Grade 1 requirements.
 - 2. Provide wide stile devices unless otherwise noted. Provide narrow stile devices where stile width is less than 5 inches.
 - 3. Provide exit device types according to door configuration as follows:
 - a. Single Doors:
 - 1) Provide mortise exit devices unless otherwise noted.
 - 2) Provide mortise exit devices where opening is also specified to receive adjustable gaskets.
 - 3) Provide rim exit devices for aluminum storefront doors.
 - b. Pair Doors:
 - 1) Provide both leaves with concealed vertical rod (CVR) exit devices.

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- c. Provide exit devices tested and certified by UL or by a recognized independent laboratory for mechanical operational testing to 10 million cycles minimum with inspection confirming Grade 1 Loaded Forces have been maintained.
- D. Standards Compliance:
 - 1. UL Listed for Panic and Fire for Class II Circuitry.
 - 2. Provide UL (DIR) listed exit device assemblies for fire-resistance-rated doors. Comply with the manufacturer's listing for the indicated fire-rating.
 - 3. Comply with UL 10C.
- E. Other Requirements:
 - 1. Vertical rod devices:
 - a. Provide less bottom rod (LBR) at scheduled locations to eliminate use of floor mounted strikes. Provide fire bolt assembly for fire-rated LBR devices.
 - 2. Outside Trims
 - a. Unless otherwise noted, provide lever trim with manufacturer's standard escutcheon plate for the required exit device type and function specified in the Hardware Sets.
 - b. Outside trim shall be compatible with the specified exit device.
 - c. Omit lever trim where an offset pull is specified. Provide cylinder attachment kits for BHMA A156.3 functions 03 and 04. Provide escutcheon plates for 03 and 04 functions where specified for wood doors that receive CVR devices.
 - 3. Provide shim kits compatible with the exit device to allow devices to minimally clear vision frames and door moldings.
- F. Approved Products:
 - 1. BEST/Precision 2000 Series.

2.07 LOCK CYLINDERS

- A. Manufacturers:
 - 1. BEST, dormakaba Group: www.bestaccess.com/.
- B. Properties:
 - 1. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
 - 2. Provide cams and tailpieces for cylinders in accordance with the corresponding hardware manufacturers' requirements and instructions for the specified device.
 - 3. Include cylinder collars, blocking rings, washers to surround and protect the exposed cylinder and portions thereof from wrenching, cutting, pulling and prying.
 - 4. Provide key cylinders with appropriate format interchangeable cores where indicated.
- C. Grades:
 - 1. Certified to BHMA A156.5 Grade 1 requirements.
- D. Material:
 - 1. Manufacturer's standard corrosion-resistant brass alloy.
- E. Types: As applicable to each item specified.
 - 1. Core Type: Small format interchangeable core (SFIC).
 - 2. Number of pinned chambers: Seven-pin.
- F. Applications:
 - 1. When provisions for lock cylinders are referenced elsewhere in the Project Manual to this Section, provide compatible type of lock cylinder, keyed to building keying system, unless otherwise indicated.
- G. Provide cylinders at locations indicated in Hardware Sets and as follows:
 - 1. As required for items with locking devices required by other Sections.
 - 2. CD Devices.
 - 3. Exit Device Trims.
 - 4. Locksets.
- H. Approved Products:

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1. BEST:
 - a. Mortise: 1E Series
 - b. Rim: 12E Series

2.08 MORTISE LOCKS FOR ALUMINUM DOORS

- A. Manufacturers
 1. Accurate Lock and Hardware Co., LLC; www.accuratelockandhardware.com/#sle
- B. Properties:
 1. Provide mortise locksets and latchsets according to the following:
 - a. Case: Heavy gauge, plated steel.
 - b. Armor Front: Adjustable bevel.
 - 1) Material: Brass, bronze, aluminum or stainless steel according to required finish. Comply with BHMA A156.18.
 - 2) Adjustable bevel faceplate.
 - c. Handing: As indicated on Drawings.
 - d. Door Thickness Coordination Fitting:
 - 1) 1-3/4 inch (44 mm) standard lock configuration.
 - 2) Provide locksets according to door thickness specified.
 - e. Latch:
 - 1) Brass material.
 - 2) Anti-friction operation.
 - 3) Latchbolt Throw: 1/2-inch (12.7 mm), minimum.
 - f. Strike: 4-7/8 inches tall, ASA type with dust box.
 - g. Backset: 2 inches
 - h. Cylinders: Provide cylinders compatible with the required permanent key system.
 - i. Trim:
 - 1) Sectional type:
 - (a) Oblong shape
 - (b) 1/2-inch projection
 - (c) 2-11/16 inches tall
 - (d) 1-3/16 inches wide
 - (e) 1-1/2 inches center-to-center (CTC) fastener hole pattern.
 - 2) Lever:
 - (a) Match design of mortise locksets for hollow metal and wood doors..
 - (b) Omit outside lever where pull trim is separately specified.
 - j. Function: See Hardware Sets.
- C. Finishes: Comply with BHMA A156.18 requirements for the finishes identified in Hardware Sets.
- D. Approved Products: Provide Accurate 8800 Series locksets.

2.09 MORTISE LOCKS FOR WOOD DOORS AND HOLLOW METAL DOORS

- A. Manufacturers:
 1. BEST, dormakaba Group: www.bestaccess.com/.
- B. Properties:
 1. Provide mortise locksets and latchsets according to the following:
 - a. Handing: As indicated on Drawings.
 - b. Fitting modified ANSI A115.1 door preparation.
 - c. Door Thickness Coordination Fitting:
 - 1) 1-3/4 inch standard lock configuration.
 - 2) Available for up to 2-1/4 inches thick door. Provide locksets according to door thickness specified.
 - d. Latchbolt and Deadbolt Extension: Minimum of 3/8 inch into the case when fully extended.

- e. Latch: Stainless-steel.
 - 1) Latchbolt Throw: 3/4 inch, minimum.
- f. Auxiliary Deadlatch: One-piece stainless-steel, permanently lubricated.
- g. Backset: 2-3/4 inch.
- h. Cylinders:
 - 1) Cylinder Core Types:
 - (a) 7-pin.
 - (b) Small format interchangeable core (SFIC).
 - (c) Provide cylinders with keyed SFIC temporary construction cores.
- i. Lever Trim:
 - 1) Style:
 - (a) Sectional type.
 - (b) Lever Design: Match lever design of cylindrical locksets.
 - 2) Special, high-strength springs and a positive stop eliminate unsightly sagging levers.
 - 3) Spindle: Trims shall utilize 5/16-inch (8 mm) high-strength alloy steel spindles for extra durability.
 - 4) Independent support springs for inside and outside levers.
 - 5) Handles: Made of forged or cast brass, bronze, or stainless-steel construction. Levers that contain a hollow cavity are not acceptable.
 - 6) Levers to operate a roller bearing spindle hub mechanism.
 - 7) Visual Indicators:
 - (a) Provide mortise locksets with visual indicators where noted in the hardware sets and at the following locations:
 - (1) Visual indicators are required on both sides of the door where privacy function is specified (VIBE).
 - (b) Indicators are to be designed to display the lock status of the outside lever. Indicators shall function as follows:
 - (1) Privacy function locksets shall have text reading OCCUPIED displayed in the window when in the locked position and VACANT when in the unlocked position (O).
 - (2) When in the locked state, the indicator window shall display a closed padlock icon on red background.
 - (3) When in the unlocked state, the indicator window shall display an open padlock icon on green background.
 - (c) Visual indicator trim shall be compatible with the corresponding lockset trim and lockset function.

- C. Finishes:
 - 1. Comply with BHMA A156.18 requirements for the finishes identified in Hardware Sets.
- D. Grades:
 - 1. Comply with BHMA A156.13, Operational Grade 1 requirements.
- E. Other Requirements:
 - 1. Provide locksets made in a manufacturing facility to compliant with ISO 9001-Quality Management and ISO 14001-Environmental Management.
- F. Approved Products:
 - 1. BEST 40H Series 15.

2.10 CYLINDRICAL LOCKS

- A. Manufacturers:
 - 1. BEST, dormakaba Group: www.bestaccess.com/.
- B. Properties:

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1. UL listed for use on single doors with fire-resistance-rating up to 3 hours and minimum latchbolt throw of 1/2 inch.
2. UL listed for use on pairs of doors with fire-resistance-rating up to 3 hours and minimum latchbolt throw of 3/4 inch.
3. Mechanical Locks:
 - a. Fitting modified ANSI A115.2 door preparation.
 - b. Door Thickness Coordination Fitting:
 - 1) 1-3/4 inches to 2-1/4 inches thick doors without the use spacers.
 - 2) Provide locksets according to door thickness specified.
 - c. Construction: Hub, side plate, shrouded rose, locking pin to be a one-piece casting with a shrouded locking lug.
 - 1) Through-bolted anti-rotational studs.
 - 2) Chassis: Critical latch and chassis components are brass or corrosion- treated steel.
 - 3) Cast stainless-steel latch retractor with roller bearings for exceptionally smooth operation and superior strength and durability.
 - d. Bored Hole: 2-1/8 inches diameter.
 - e. Backset:
 - 1) 2-3/4 inches except at the following locations:
 - (a) Provide 3-3/4 inches backset where adjustable gaskets are provided.
 - f. Latch:
 - 1) Stainless-steel.
 - 2) Latchbolt Throw:
 - (a) 9/16-inch, minimum.
 - (b) Provide 3/4-inch-throw at fire-rated pair doors.
 - g. Cylinders:
 - 1) Cylinder Core Types:
 - (a) 7-pin
 - (b) Small format interchangeable core (SFIC).
 - (c) Cylinders shall be compatible with the required permanent key system.
 - (d) Provide cylinders with keyed SFIC temporary construction cores.
 - h. Lever Trim:
 - 1) Style: See Hardware Sets.
 - 2) Special, high-strength springs and a positive stop eliminate unsightly sagging levers.
 - 3) Strength: Locksets outside locked lever designed to withstand minimum 1,400 inch-lbs of torque. In excess of that, a replaceable part will shear. Key from outside and/or inside lever will still operate lockset.
 - 4) Independent spring mechanism for each lever.
 - (a) Contain lever springs in the main lock hub.
 - 5) Outside Lever Sleeve: Seamless one-piece construction.
 - 6) Keyed Levers:
 - (a) Removable only after core is removed by authorized control key.
 - (b) Levers shall accept required cylinder core type. The compatible tailpiece for cylinder core shall be included by the lockset manufacturer.

C. Finishes:

 1. Comply with BHMA A156.18 requirements for the finishes identified in Hardware Sets.

D. Grades: Comply with BHMA A156.2, Series 4000, Operational Grade 1 requirements.

 1. Durability: Passing 50 million cycle tests verified by third party testing agency.

E. Material: Manufacturer's standard for specified lock.

 1. Critical Latch and Chassis Components: Brass or corrosion-resistance treated steel.
 2. Outside Lever Sleeve: Hardened steel alloy.

- F. Approved Products:
1. BEST 9K Series with 15C trim style.

2.11 SURFACE CLOSERS

- A. Manufacturers:
1. Cam-Action Closers:
 - a. dormakaba; dormakaba Group: www.dormakaba.com/us-en/.
 2. Rack-and-Pinion Closers:
 - a. BEST, dormakaba Group www.bestaccess.com/.
- B. Types—Provide rack-and-pinion type closers except where cam-action closers are specified.
- C. Grades:
1. Comply with BHMA A156.4, Grade 1 requirements.
 2. Underwriters Laboratories Compliance:
 - a. Product Listings:
 - 1) UL (DIR) and ULC for use on fire-resistance-rated doors.
 - 2) Meeting requirements of UL 10C for positive pressure.
- D. Properties—Cam-Action Closers:
1. Mounting: Closers are to be surface mounted.
 2. Maximum Projection from Face of Door: 2-1/2 inches.
 3. Mechanism:
 - a. Cam-action closers shall include steel cam, roller, and adjustable spring, incorporating a track arm assembly.
 - b. Include separate, tamper-resistant, retention ring, self-regulating adjusting valves for closing and latching speeds, and backcheck.
 - c. Body: Provide cast iron closers. Aluminum alloy body is acceptable for cam-action closers.
 - d. Spring Power Adjustment: Field-adjustable for BHMA A156.4 sizes 1 through 5 unless otherwise noted.
 4. Hydraulic Fluid: All-weather type.
 5. Arm Assembly:
 - a. Provide arms with integral hold-open feature as specified in the Hardware Sets. Omit mechanical hold-open from fire-rated doors.
 - b. Provide standard track assemblies unless otherwise noted.
 - c. Where obstructions limit opening angle and wall or floor stops are prohibited, provide heavy duty spring-loaded stop track arms according to required mounting side:
 - 1) Pull Side Mount: Provide ST track arm assembly.
 - 2) Push Side Mount: Provide SPT track arm assembly.
 - 3) Cushion stop blocks are not approved as a substitute for heavy duty spring-loaded stops. If approved manufacturer does not offer spring-loaded stop track arm assemblies, provide the following products:
 - (a) An approved cam-action closer with standard track arm assembly (pull-side or push side, as indicated) in conjunction with approved heavy-duty concealed overhead stop.
 - (b) Provide adapter plate to accommodate closer and overhead stop installation.
- E. Properties—Rack-and-Pinion Closers:
1. Mounting: Closers are to be surface mounted.
 2. Maximum Projection from Face of Door: 2-1/4 inches.
 3. Construction: Closer bodies shall be corrosion resistant aluminum.
 4. Mechanism:
 - a. Full rack and pinion constructed from corrosion resistant aluminum, incorporating a double lever arm assembly.

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- b. Include separate, tamper-resistant, self-regulating adjusting valves for closing and latching speeds, and backcheck.
 - c. Spring Power Adjustment: Field-adjustable for BHMA A156.4 sizes 1 through 6.
 - d. Hydraulic Fluid: All-weather type.
 - 5. Arm Assembly:
 - a. Provide standard arm assemblies unless otherwise noted.
 - b. Provide arms with integral hold-open feature as specified in the Hardware Sets. Omit mechanical hold-open from fire-rated doors.
 - c. Parallel arm to be a heavy-duty rigid arm (SPA).
 - d. Where obstructions limit opening angle and wall or floor stops are prohibited, provide heavy duty spring-stop arms according to required mounting side:
 - 1) Pull Side Mount: Provide S-IS arm assembly.
 - 2) Push Side Mount:
 - (a) Parallel Arm Mount: Provide S-DS arm assembly.
 - (b) Top Jamb Mount: Provide S-IS for standard reveals and S-ISJ for reveals greater than standard.
 - e. Where IS arm assemblies and S-IS arm assemblies are specified in hardware sets, if approved manufacturer does not offer these arm assemblies, provide the following items:
 - 1) An approved closer with a standard arm assembly (regular or top jamb, as indicated) in conjunction with an approved heavy-duty concealed overhead stop.
 - 2) Provide adapter plate to accommodate closer and overhead stop installation.
 - 6. Covers:
 - a. Type: Full cover.
 - b. Material: Plastic.
 - c. Finish: Painted.
- F. Other requirements:
 - 1. Provide closers with delayed action (DA) feature where specified in the Hardware Sets. DA feature shall include a separate independent valve for delay control adjustment. DA closers shall comply with BHMA A156.4 delayed action closer requirements.
 - 2. Cam-action closers:
 - a. Provide cam-action closers with backplates.
 - b. Provide angle brackets for closers for ST and SPT track arm assemblies.
 - 3. Installation:
 - a. Mount closers on non-public side of door and stair side of stair doors unless otherwise noted in hardware sets.
 - b. At outswinging exterior doors, mount closer on interior side of door.
 - c. Provide adapter plates, shim spacers, and blade stop spacers as required to accommodate the following:
 - 1) Frame conditions.
 - 2) Door conditions.
 - 3) Required door hardware.
- G. Approved Products:
 - 1. Surface Mounted Cam-Action Closers:
 - a. Dormakaba: TS93 Series.
 - 2. Surface Mounted Rack-and-Pinion Closers:
 - a. BEST: EHD9000 Series.
 - b. Mounting Type: Concealed in the frame.
 - c. Construction:
 - 1) Cast-iron body along with heavy-duty ball bearings at the spindle.
 - 2) Steel cam-and-roller assembly coupled to dual steel pistons.
 - d. Single acting and double acting as indicated on Drawings.

- e. Provide manufacturer's recommended brackets, arm assemblies, channels, and accessories for adapting closers to the indicated door and frame materials.
- f. Exterior doors weighing maximum 200 pounds.
- g. Interior doors weighing maximum 250 pounds.
- h. The specified hinges and pivots.
- i. Mechanism:
 - 1) Compact design fitting a 1-3/4" x 4" header for aluminum frames.
 - 2) Sweep and latch closing speeds are to be controlled by two noncritical temperature compensating valves.
 - 3) Built-in pressure relief valve.
 - 4) Mechanical backcheck to slow the door prior to contact with the cushion.
 - 5) Provide barrier free design at interior non-rated doors.
 - 6) Include integral cushion for 105° swing unless 90° is specified in the Hardware Sets.
- j. Include cover plates with the hardware finish indicated in the Hardware Sets.
- k. Include brackets and mounting channels as required to ensure proper installation.
- l. Provide extended spindle as required to allow for the required clearance at the bottom of the door.
- m. Provide adapter plates, shim spacers, and blade stop spacers as required by frame and door conditions.
- n. Provide mounting channels for concealed closers in hollow metal frames.
- o. Provide offset slide arm cover channels for frames with single acting doors equipped with hinges and pivots.

2.12 OVERHEAD STOPS AND HOLDERS

- A. Manufacturers:
 - 1. ABH: www.abhmfg.com.
- B. Properties:
 - 1. Function:
 - a. As indicated in the hardware sets.
 - b. Stop Settings:
 - 1) Field-adjustable 85 to 110 degrees opening.
 - 2) Field-adjustment capability shall be able within range of 85 to 110 degrees in increments of 5 degrees.
 - c. Function: As indicated in the hardware sets. Provide stop-only function in lieu hold-open at fire-rated doors.
 - d. Hold-Open Settings:
 - 1) Selective on/off and friction holden as indicated in the hardware sets.
 - 2) Hold open positions to be field-adjustable except where template degree is noted in the hardware sets. Field-adjustment capability shall be able within range of 85 to 110 degrees in increments of 5 degrees.
 - 3) Provide nylon composites for proven friction resistance and durability at friction hold-open functions.
 - e. Provide units with built-in cushion stop except where units are specified as less spring cushion (LS).
 - 2. Sizes: As recommended by manufacturer's based on hinge/pivot type and frame opening width.
- C. Finishes:
 - 1. Comply with BHMA A156.18 requirements for the finishes identified in Hardware Sets.
 - 2. Provide all non-ferrous materials at exterior locations (N).
 - 3. Arms and Brackets: Comply with BHMA A156.18 requirements for the finishes identified in Hardware Sets.
- D. Grades:

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1. Comply with BHMA A156.8 , Grade 1 requirements unless otherwise noted.
 2. Provide units that meet or exceed BHMA A156.8, Grade 3 requirements at doors that are up to 24 inches wide and where noted in the hardware sets. Units shall meet or exceed BHMA A156.8, Grade 1 requirements for doors greater than 24 inches wide.
 3. Underwriters Laboratories Compliance:
 - a. Product Listing: UL (DIR) and ULC for use on fire-resistance-rated doors.
 - b. Comply with NFPA 80 and UL10C requirements for the indicated fire rating.
 4. Material: Base metal as indicated for each item by BHMA material and finish designation.
 5. Types—As indicated in the Hardware Sets:
 - a. Surface-applied.
 - b. Concealed, slim design (SL)
- E. Additional Requirements:
1. Consult factory for non-standard templating to accommodate the other required hardware.
 2. Provide angle jamb bracket for pull-side mounting overhead stops at inswing doors specified to receive surface mounted overhead stops.
 3. Approved Products:
 - a. Surface Overhead Stops and Holders:
 - 1) Grade 1:
 - (a) ABH: 9000A Series.
 - 2) Grade 3:
 - (a) ABH: 4400 Series.
 - b. Concealed Overhead Stops and Holders:
 - 1) Grade 1:
 - (a) ABH: 1000SA Series
 - 2) Grade 3:
 - (a) ABH: 4000RA Series

2.13 PROTECTION PLATES

- A. Manufacturers:
1. Architectural Builders Hardware Mfg (ABH): www.abhmfg.com.
- B. Plate Types:
1. Kick Plates:
 - a. Provide along bottom edge of push side of doors with closers, unless otherwise indicated.
 - b. Omit kick plates at the following locations:
 - 1) Aluminum storefront and glass entry doors.
 2. Mop Plates: Provide along bottom edge of pull-side door faces to provide protection from cleaning liquids and equipment damage to door surface.
- C. Plate Sizes:
1. Thickness: 0.050-inch
 2. Heights:
 - a. Kick Plates: 10 inches tall.
 - b. Mop Plates:
 - 1) 6 inches tall unless otherwise noted.
 3. Widths:
 - a. Push Side Mounted Plates:
 - 1) Single Doors:
 - (a) Unless otherwise noted, 2 inches less than door width (LDW).
 - (b) 2-1/2 inches LDW at openings with adjustable gasketing.
 - 2) Pair Doors:
 - (a) Unless otherwise noted, 1-inch LDW.
 - (b) 2 inches LDW at openings with push-side astragal.

- (c) 2 inches LDW at openings with adjustable gasketing.
- b. Pull Side Mounted Plates:
 - 1) Unless otherwise noted: 1/2-inch LDW.
 - 2) At pair doors with an astragal on the pull side: 1-1/2 inches LDW.
- D. Edges: Beveled sides, top, and bottom edges (B4E).
- E. Grades:
 - 1. Comply with BHMA A156.6 requirements according to type:
 - a. Kick Plates: J102
 - b. Mop Plates: J103
- F. Provide UL labeled stamped into protections plates at fire rated doors where the top of the protection plate is 16 inches above the bottom of the door.
- G. Material:
 - 1. Metal Properties: Compliant with BHMA A156.18 finish number indicated in the Hardware Set.
- H. Installation:
 - 1. Fasteners: Countersunk screw fasteners
- I. Approved Products:
 - 1. ABH: PP0050 Series.

2.14 STOPS AND HOLDERS

- A. Manufacturers:
 - 1. Architectural Builders Hardware Mfg (ABH): www.abhmfg.com.
- B. General:
 - 1. Provide overhead stop/holder when wall or floor stop is not feasible.
- C. Grades:
 - 1. Comply with BHMA A156.16 Resilient Material Retention Test requirements.
 - 2. Wall Type Bumper: L02251 with fasteners compatible with wall construction.
- D. Material: Base metal as indicated for each item by BHMA material and finish designation.
- E. Types:
 - 1. Wall Bumpers: Bumper, concave, wall stop in cast housing .
- F. Products—Provide stops from one approved manufacturer as follows:
 - 1. Wrought Concave Wall Bumpers:
 - a. ABH: Model #AB409

2.15 THRESHOLDS

- A. Manufacturers:
 - 1. National Guard Products, Inc: www.ngpinc.com/.
- B. Properties:
 - 1. Threshold Surface:
 - a. Fluted horizontal grooves across full width unless otherwise noted.
 - b. Provide smooth, flat threshold surface for automatic door bottom gasket.
 - 2. Thresholds shall be barrier-free designs.
 - 3. Length: Match corresponding opening width
- C. Grades:
 - 1. Comply with BHMA A156.21 requirements according to type.
 - 2. Provide BHMA A156.21 standard duty thresholds unless otherwise noted.
- D. Types:
 - 1. Saddle Thresholds:
 - a. Exterior Saddle Thresholds:

- b. Interior Saddle Thresholds:
 - 1) Typical Wall Thickness: 1/8-inch.
 - 2) Overall Height: 1/4-inch.
 - 3) Width: 4 inches
 - 2. Bumper Seal Thresholds with Gasket:
 - a. Include silicone gaskets.
 - b. Overall Height: 1/2-inch.
 - c. Width: 5 inches.
 - d. Typical Wall Thickness: 1/8-inch minimum
 - 3. Plate Thresholds:
 - a. Smooth flat top solid metal member.
 - b. Height: 1/4-inch unless otherwise noted.
 - c. Width: 4 inches unless otherwise noted.
- E. Fasteners—Requirements according to type as follows:
 - 1. Metal thresholds:
 - a. Include stainless-steel machine screws and lead anchors for installing threshold at masonry floors.
 - b. Include stainless-steel wood screws for installing threshold at wood floors.
- F. Approved Products:
 - 1. Bumper Thresholds:
 - a. NGP Model #896S
 - 2. Plate Thresholds:
 - a. NGP Model #8144 Smooth Side Up.
 - 3. Saddle Thresholds:
 - a. Interior Type: NGP Model #413

2.16 WEATHERSTRIPPING AND GASKETING

- A. Manufacturers:
 - 1. National Guard Products, Inc: www.ngpinc.com/.
- B. Fabrication: Provide gasketing and weatherstripping products in continuous lengths sized according to type as follows:
 - 1. Length to match corresponding frame component:
 - a. Drip Caps: 4 inches greater than door width.
 - b. Astragals: Match door height.
 - c. Gaskets and Weatherstrips—Length to match corresponding frame component:
 - 1) Frame head: Match opening width.
 - 2) Frame jambs: Match opening height.
 - d. Door Bottoms and sweeps: Match door width.
- C. Properties:
 - 1. Weatherstripping Air Leakage Performance: Not exceeding 0.3 cfm/sq ft of door opening at 0.3 inches of water pressure differential for single doors, and 0.5 cfm/sq ft of door area at 0.3 inches of water pressure differential for double doors for gasketing other than smoke control, as tested according to ASTM E283/E283M; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
 - 2. Fire-Rating: At fire rated doors, provide products certified by UL to UL10C, complying NFPA 80 and NFPA 252 for application to hollow metal fire doors rated up to 3 hrs., and wood fire doors rated up to 90 minutes.
 - 3. Smoke and Draft Control: Provide products certified by UL to UL1784 complying NFPA 105.
- D. Drip Caps:
 - 1. Material: Aluminum

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2. Application: Surface mounted with screws to exterior side of frame face.
- E. Astragals:
 1. Beveled T-Astragal:
 - a. Gasketing Material: Silicone bulb
 - b. Retainer Material: Aluminum
 - c. Application Type: Surface mounted with screws to door edge of active leaf.
 2. Flat Bar Astragal:
 - a. Material: 2 inches x 1/8-inch-thick aluminum or steel.
 - b. Application: Surface mounted with screws to pull-side door face of active leaf.
 3. Mortise Astragal for double acting doors:
 - a. Gasketing Material: Black Nylon Brush
 - b. Retainer Material: Aluminum
 - c. Application Type: Mortised into center of door vertical edges.
- F. Adhesive-Backed Gasketing:
 1. Acoustic Pads:
 - a. Material: Acoustic Foam
 - b. Application: Surface mounted with pressure sensitive adhesive, adhered to the door rabbet of jambs at bottom of the frame.
 - c. Provide acoustic pads where doors are equipped with automatic door bottoms that concealed in the bottom edge of the door.
 2. Bulb Gasketing:
 - a. Material: Silicone bulb
 - b. Application—Surface mounted with modified acrylic pressure sensitive adhesive, adhered to the following:
 - 1) Stops at frame heads.
 - 2) Strike jamb frame stops.
 - 3) Door rabbet of hinge jamb.
 - c. 3-Fin Gasketing:
 - 1) Material: Thermo-Plastic Elastomer, triple-fin
 - 2) Application—Surface mounted with modified acrylic pressure sensitive adhesive, adhered to the following:
 - (a) Door rabbet of heads.
 - (b) Door rabbet of strike jambs.
 - (c) Hinge jamb frame stops.
- G. Adjustable Gasketing:
 1. Housing:
 - a. Height according to frame type:
 - 1) Provide 13/16-inch gasket housing for cased open frames.
 - 2) Provide 1/2-inch gasket housing for frames that require an integral stop.
 - b. Width: 1-1/4 inches.
 - c. Material: Aluminum with screw-adjustable retainer.
 2. Gasket Material: Silicone
 3. Adjustment
 - a. Range: 1/4-inch.
 - b. Adjustment screws spaced 10 inches on center.
 4. Application: Surface-mounted to soffit of frame heads and jambs. Miter cut the ends of adjustable gasket lengths at head and jamb corners. The other ends are to be square cut.
- H. Weatherstrips:
 1. Retainer Material: Aluminum
 2. Gasket Material: Silicone bulb
 3. Application: Surface mounted with screws to frame soffit of heads and jambs.
 4. Provide bar-type weatherstrips where other soffit mounted hardware occurs:

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- a. Retainer Material: 1/4-inch-thick x 1-1/2 inches wide solid aluminum
 - b. Gasket Material: Silicone bulb
- 5. Provide concealed fastener type where specified in the Hardware Sets.
- I. Door Bottoms:
 - 1. Automatic Door Bottom:
 - a. Endurance tested to 5 million cycles.
 - b. Flame-Resistant
 - c. Moisture-Resistant
 - d. Housing Fitment: 5/8-inch wide x 1-7/16 inches tall mortise.
 - e. Gasket: Silicone in aluminum housing
 - f. Maximum Drop: 1/2-inch.
 - g. Application: Concealed in bottom of the door, centered in bottom edge of door.
 - h. Provide end caps for both ends of the door bottom.
 - 2. Brush Sweeps:
 - a. Retainer Material: Aluminum.
 - b. Gasket Material: 3/4-inch exposed nylon brush
 - c. Application: Surface mounted with screws at the bottom of the pull-side door face. Provide 5/16-inch wide x 3/4-inch-tall snap-on cover to conceal fasteners.
 - d. Include retainers with integral drip design at exterior outswing doors.
 - e. Unless otherwise noted the nylon brush shall include an EPDM rubber insert.
- J. Grades: Comply with BHMA A156.22.
- K. Approved Products:
 - 1. Astragals:
 - a. Beveled T Astragals:
 - 1) NGP Model #158S
 - b. Flat Bar Astragal:
 - 1) NGP Model #139 Series
 - c. Mortise Astragal for double acting doors:
 - 1) NGP Model #A635-BB
 - 2. Drip Caps:
 - a. NGP Model #16
 - 3. Head and Jamb Seals:
 - a. Adhesive Gasketing, Acoustic Pads:
 - 1) NGP Model #60FP
 - b. Adhesive Gasketing, Bulb:
 - 1) NGP: 2525 Series
 - c. Adhesive Gasketing, 3-Fin :
 - 1) NGP: 5075 Series
 - d. Adjustable Gaskets for frames with integral stop:
 - 1) NGP 107 Series
 - e. Adjustable Gaskets for cased open frames:
 - 1) NGP 1038N Series
 - f. Weatherstrips:
 - 1) NGP: 161S
 - g. Bar Weatherstrips:
 - 1) NGP 700S Series
 - h. Weatherstrips, Concealed Fastener:
 - 1) NGP 172S Series
 - 2) Pemko 29310 S Series
 - 4. Door Bottom Seals:
 - a. Automatic Door Bottoms:
 - 1) NGP Model #225S Series

- b. Brush Sweep:
 - 1) NGP Model #C697
- c. Drip Sweep:
 - 1) NGP Model #C699

2.17 MISCELLANEOUS ITEMS

- A. Properties:
 - 1. Mounting Brackets:
 - a. Provide mounting brackets to eliminate interference of installation of closer soffit plates with other soffit mounted hardware.
 - b. Mounting brackets shall be sized as recommended by the manufacturer according to soffit width and stop height.
 - 2. Silencers:
 - a. Provide at equal locations on door frame stops to mute sound of door's impact upon closing. Provide silencers according to frame material and opening type as follows:
 - 1) Frame Material:
 - (a) Hollow Metal Frames: Provide silencers compliant with BHMA A156.16 L03011 requirements.
 - (b) Wood Frames: Provide silencers compliant with BHMA A156.16 L03021 requirements.
 - 2) Opening Type:
 - (a) Single Door: Provide three on strike jamb of frame.
 - (b) Pair of Doors: Provide two on head of frame, one for each door at latch side.
 - b. Material: Rubber, gray color.
- B. Approved Products:
 - 1. Mounting Brackets:
 - a. Provide ABH 3750 Series except where soffit component obstacle is greater than 5/8-inch tall.
 - b. Where obstacles are greater than 5/8-inch tall and no more than 15/16-inch tall, provide NGP 3SP Series.
 - 2. Silencers:
 - a. Metal Frames: Provide ABH Model #AB608.

2.18 ELECTRIFIED HARDWARE

- A. Properties:
 - 1. Door Position Switches—Recessed devices with magnetic contact complying with the following:
 - a. Effective Gap Range: Up to 1/2-inch maximum.
 - b. Power Rating: 200mA Max, 30VAC/VDC.
 - c. Mounting: Self-locking.
 - d. Size: 3/4-inch diameter.
 - e. Switch Configuration: SPDT with magnetic tamper except where DPDT is required.
- B. Approved Products:
 - 1. Door Position Switches:
 - a. Dormakaba: MC Series
 - 2. Monitor Strike:
 - a. Provide Dormakaba MS Series where specified in the Hardware Sets.

2.19 KEYS AND CORES

- A. Manufacturers:
 - 1. BEST, dormakaba Group: www.bestaccess.com/.
- B. Properties:
 - 1. Comply with BHMA A156.28.

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2. Cores:

- a. Permanent Cores—Furnish keyed cores for locksets and cylinders complying with the following:
 - 1) Grade: Meet or exceed A156.5 Grade 1 requirements and exceed extended life cycle testing.
 - 2) Core Format and Profile: SFIC.
 - 3) Number of pinned chambers: 7.
 - 4) Keyway: As selected by Owner from manufacturer's offering based on security level required.
 - 5) Keying:
 - (a) Comply with the Owner-Approved Keying Schedule.
 - (b) Key System Level: Great grand master keyed unless otherwise instructed by Owner at Keying Meeting.
 - 6) Finish: Match corresponding lock.
- b. Temporary/Construction Cores—Provide locksets and cylinders with construction cores that comply with the following:
 - 1) Construction cores shall be identical to permanent cores except as follows:
 - (a) Keyway: Use manufacturer's standard keyway. The keyway for construction cores shall be incompatible with permanent cores.
 - (b) Keying: Construction cores shall be key-alike.
 - (c) Finish: Faces shall be painted green.

3. Keys:

- a. Keys for construction cores shall be incompatible with permanent cores.
- b. Furnish keys in following quantities:
 - 1) Construction Core Keys:
 - (a) Construction Core Operating Keys: 15 each.
 - (b) Construction Control Keys: 2 each.
 - 2) Permanent Keys:
 - (a) Top Master Key: 1 each.
 - (b) Master Keys: 4 each.
 - (c) Control Keys: 2 each.
 - (d) Change Keys: 2 each for each permanent core.
- c. Key Control:
 - 1) Furnish key collection envelopes, receipt cards, and index cards in quantity suitable to manage number of keys.
 - 2) Stamping:
 - (a) Furnish permanent keys and cores with key control stamping:
 - (1) Legibly stamp cores with corresponding key symbol identified in the Owner-Approved keying schedule. Key symbol marking shall not be visible when core is installed.
 - (2) Legibly stamp the bow permanent keys with the phrase "Do Not Duplicate" and with the corresponding key symbol identified in the Owner-Approved keying schedule.
 - 3) Include installation of permanent cores.

C. Approved Products:

1. BEST

- a. Construction Cores: Provide Model #7190224
- b. Construction Core Control Keys: Provide Model #7147449
- c. Construction Core Operating Keys: Provide Model #7148872
- d. Permanent Cores and Keys: Provide BEST Patented CORMAX keys and cores.

2.20 FINISHES

- A. Provide hardware finished according to the following requirements:

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1. Construction Core Faces: Painted green.
2. Cylinder Housings: Match finish of corresponding lock.
3. Permanent Core Faces:
 - a. Provide satin brass finish cores complying with BHMA A156.18 finish code 606 for black finish locksets and cylinders.
4. Gasket material fixed in screw-on retainers: Black.
5. Hardware for Aluminum Storefront Doors:
 - a. Except for closers, hardware at aluminum doors shall be finished to match door panel finish.
 - b. Closers: Coating color shall be the BHMA A156.18 appearance equivalent finish of the corresponding hinge finish.
6. Scheduled Finish Code 000:
 - a. Adhesive Gaskets: Black.
 - b. Door Position Switches: Black.
 - c. Monitor Strikes: Manufacturer's standard.
 - d. Silencers: Black rubber.
7. Screw-on retainers of gaskets and weatherstrips:
 - a. Head, jamb, and mullion mounted items shall be finished to match corresponding frame color.
 - b. Door mounted items shall be finished to match corresponding door color.
8. Other Hardware: Comply with BHMA A156.18 requirements for the finishes identified in Hardware Sets.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify the following is correct and complete prior to installing door hardware:
 1. Doors and frames are labeled, frames are properly installed, and dimensions are as indicated on Drawings.
 2. Frames are square and plumb.
 3. Finishing of doors and frames has been completed.
 4. Field-painting of factory primed hardware has been completed.
 5. Allow finishes to cure for at least seven calendar days prior to installing hardware.
 6. Masonry wash down is complete.
 7. Confirm walls have sufficient blocking and reinforcements for wall-mounted hardware.
 8. Confirm doors and frames are correctly prepared for hardware and have sufficient blocking and reinforcements for hardware.
- B. Correct all defects and deficiencies prior to proceeding with installation.

3.02 INSTALLATION

- A. Wall Blocking—Provide internal blocking, reinforcements, and supports in walls in accordance with the manufacturer's instructions for the following:
 1. Wall Stops
 2. Other wall-mounted hardware.
- B. Install hardware in accordance with manufacturer's instructions and applicable codes.
- C. Install hardware using the fasteners provided from the manufacturer and in accordance with the manufacturer's instructions.
- D. Drill, tap, and countersink screw holes that are required by the manufacturer but could not be done at the factory. Comply with manufacturer's instructions.
- E. Self-clinching fasteners, rivet nuts, and threaded inserts are not permitted.
- F. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.
- G. Install hardware for smoke and draft control doors in accordance with NFPA 105.

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- H. Use templates furnished for the hardware item by its manufacturer.
- I. Do not install surface mounted items until application of finishes to substrate is fully complete.
- J. Wash down masonry walls and complete painting or staining of doors and frames.
- K. Complete finish flooring prior to installation of aluminum thresholds.
- L. Install flushbolts and hardware containing concealed rods prior to installing doors.
- M. Install coordinators, fillers, and mounting brackets after door and hinge installation and prior to installing closers and strike for exit devices.
- N. Where frame soffits receive gaskets, install soffit mounted hardware items to mounting brackets designed to prevent damage to gaskets and gasket housings.
- O. Hardware locations:
 - 1. Comply with ICC A117.1 and mounting heights indicated on Drawings.
 - 2. Install in compliance with DHI TDH-009-20.
 - 3. For Aluminum Doors and Frames: See Section 084313.
 - 4. For Steel Doors and Frames: See Section 081113.
 - 5. For Wood Doors comply with the following:
 - a. Section 081416 and 081423.16.
 - 6. Mounting centerline heights unless otherwise indicated on Drawings:
 - a. Distance from finished floor to center line of hardware item:
 - 1) Strikes for lever locksets:
 - (a) At new frames: 40 inches.
 - 2) Exit Devices:
 - b. Silencers:
 - 1) Single Door Openings—Install three silencers in frame stop of strike jamb as follows:
 - (a) 8 inches from top of finished opening to top-silencer centerline.
 - (b) 2 inches from top of strike to middle-silencer centerline.
 - (c) 10 inches from finished floor to bottom-silencer centerline.
 - 2) Pair Door Openings—Install two silencers in frame stop of head as follows:
 - (a) Install silencers on the active door side and inactive door side.
 - (b) Locate silencers 5 inches from center of head to silencer centerline.
 - (c) Space silencers 10 inches on center.
- P. Weatherstrip and Gaskets:
 - 1. Install weatherstrips and gaskets in continuous lengths to achieve full and uninterrupted seal at heads and at jambs.
 - 2. Install weatherstrips after door and hinge installations and prior to installing closers, strikes for exit devices, and soffit mounted hardware.
 - 3. Install closer soffit plates, strikes for rim exit devices, top strikes for SVR exit devices, and other soffit mounted hardware against bar-type weatherstrip.
 - 4. Clean frames in accordance with gasket manufacturer's instructions prior to installing adhesive-backed gaskets.
- Q. Thresholds:
 - 1. Install plate type thresholds with the smooth side facing upwards.
 - 2. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal.
 - 3. Anchor thresholds to floor with stainless-steel countersunk screws.
 - 4. See Section 079200 for additional requirements.
- R. Install construction cores in locksets and cylinders for use during the construction period. Replace construction cores with permanent cores at Substantial Completion unless otherwise instructed by the Owner.
- S. Field Painting Factory-Primed Hardware:

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1. Paint the following hardware to match corresponding frame finish prior to installation:
 - a. Mounting Brackets.
2. Comply with Section 099000 and the manufacturer's instructions. Mask and tape off moving parts, triggers, releases, actuating portions, bearings, testing agency labels, and fastener holes prior to painting. Remove masking and tape after painting is completed and prior to installation of hardware.
3. Ensure hardware functions and operates properly before and after applying paint. Immediately replace damaged and defective hardware.

3.03 FIELD QUALITY CONTROL

- A. Perform field inspection and testing. Comply with Section 014000 - Quality Requirements.
- B. Enlist services of an AHC to perform the following:
 1. Certify that hardware has been furnished and installed in accordance with the following:
 - a. The manufacturer's instructions and as specified.
 - b. Project requirements.
 2. Schedule at least two inspections by AHC, the first shall be promptly after hardware installation is complete. The second shall be two weeks prior to Substantial Completion.
 3. Include report from AHC inspection results in closeout documents.

3.04 ADJUSTING

- A. Adjust work under provisions of Section 017000 - Execution and Closeout Requirements.
- B. Adjust hardware according to instructions in AHC inspection reports.
- C. Adjust hardware for smooth operation.
- D. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.
- E. Ensure sound seals are adjusted such that a Arkansas driver's license continuously meets resistance between seal and door.
- F. Adjust closers to comply with ICC A117.1.
- G. Adjustments shall comply with NFPA 80.

3.05 CLEANING

- A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.
- B. Clean adjacent surfaces soiled by hardware installation activities.
- C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.
- D. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

3.06 PROTECTION

- A. Protect finished Work.
- B. Provide full protective barrier between hardware and the remaining Work during construction period. Apply protective barrier and prevent damage to hardware.
- C. Do not permit adjacent work to damage hardware or finish.

3.07 SCHEDULES

- A. Scheduled Finishes:
 1. 000—Custom Finish
 2. 600—Primed For Painting
 3. 606—Satin Brass/Brass Base Material
 4. 622—Flat Black Coated/Brass, Bronze Base Material
 5. 631—Flat Black Coated/Steel Base Material
 6. 693—Black Painted

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7. 711—Flat Black Coated Anodized/Aluminum Base Material
8. 719—Mill Finish Aluminum Uncoated

B. Scheduled Manufacturers:

1. ABH—Architectural Builders Hardware Manufacturing Inc.
2. ACC—Accurate Lock & Hardware Co.
3. BES—Best Access Systems
4. DKA—Dormakaba Architectural Hardware
5. NGP—National Guard Products, Inc
6. PRE—BEST/Precision Exit Devices

C. Opening List:

1. Door Number	Hardware Set
101	1
103	5
104	10
105	10
106	12
107	12
108a	4
108b	4
109	10
110	5
111b	2
112	8
114	12
115	11
116	9
118	3
120a	7
120b	6
202	6
S111	15
S113	15
S114	13
S115	13
S117	19
S119	16
S121	14
S122	19
S123	13
S124	19
S201	17
S202	18

D. Hardware Sets:

Set #1

2 Continuous Hinge	672 HD UL SO	711	BES
1 Exit Device	2601 CD S519 S460 S519	622	PRE
1 Exit Device	2603 CD NCA-03 S519 S460 S519	622	PRE
2 Mortise Cylinder	1E7 4 C4 PATD	622	BES
1 Rim Cylinder	12E7 2 S2 PATD	622	BES
3 Construction Core	7190224	000	BES
2 Overhead Concealed Stop	1020SA	693	ABH
2 Door Closer	EHD9016 AVB AF90 BP90	693	BES
1 Threshold	By Door Manufacturer		

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1	Set Meeting Stiles Seals	By Door Manufacturer		
1	Set Head & Jambs Weatherstrips	By Frame Manufacturer		
2	Door Bottom	By Door Manufacturer		
2	Door Position Switch	MC4 Black	000	DKA

Set #2

3	Hinge	FBB168 NRP	631	BES
1	Intruder Lockset	9K 3 7 IN 15 C S3 PATD	622	BES
2	Construction Core	7190224	000	BES
1	Door Closer	EHD9016 AVB SPA90	693	BES
1	Kick Plate	PP0050 B4E CSK	622	ABH
1	Wall Stop	AB409	622	ABH
3	Silencer	AB608 Grey	000	ABH

Set #3

3	Hinge	FBB199 NRP	622	BES
1	Exit Device	2303 LD M4903A S982	622	PRE
1	Mortise Cylinder	1E7 4 C4 PATD	622	BES
1	Construction Core	7190224	000	BES
1	Door Closer	EHD9016 AVB SDS90	693	BES
1	Saddle Threshold	413 10-24SSMS/LA	719	NGP
1	Set Bar Weatherstrips	700S Black (Head & Jambs)	711	NGP
1	Brush Sweep	C697 Black	711	NGP

NOTE: Template stop at 110 degrees.

Set #4

3	Hinge	FBB168	631	BES
1	Passage Set	9K 3 0 N 15 C S3	622	BES
1	Door Closer	EHD9016 AVB SIS90	693	BES
1	Kick Plate	PP0050 B4E CSK	622	ABH
1	Mop Plate	PP0050 B4E CSK	622	ABH
3	Silencer	AB608 Grey	000	ABH

NOTE: Template deadstop at 95 degrees.

Set #5

1	Continuous Hinge	671 HD UL SO	711	BES
1	Entrance Lockset	8856.200.29L/2R	622	ACC
1	Mortise Cylinder	1E7 4 C258 B35103 PATD	622	BES
1	Construction Core	7190224	000	BES
1	Door Closer	TS9315 T CS	693	DKA
1	Wall Stop	AB409	622	ABH
1	Set Head & Jambs Weatherstrips	By Frame Manufacturer		

Set #6

3	Hinge	FBB191 NRP	622	BES
1	Storeroom Lockset	9K 3 7 D 15 C S3 PATD	622	BES
1	Construction Core	7190224	000	BES
1	Door Closer	EHD9016 AVB SDS90	693	BES
1	Saddle Threshold	413 10-24SSMS/LA	719	NGP
1	Set Bar Weatherstrips	700S Black (Head & Jambs)	711	NGP
1	Brush Sweep	C697 Black	711	NGP

Set #7

6	Hinge	FBB191 NRP	622	BES
1	Set Self Latching Flush Bolts	1863P	693	ABH

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1	Dust Proof Strike	1870	693	ABH
1	Storeroom Lockset	9K 3 7 D 15 C S3-7/8 PATD	622	BES
1	Construction Core	7190224	000	BES
1	Door Closer	EHD9016 AVB SDST90 (Active)	693	BES
1	Overhead Holder	N9030A (Inactive)	693	ABH
1	Saddle Threshold	413 10-24SSMS/LA	719	NGP
1	Beveled T-Astragal	158S Black	711	NGP
1	Set Bar Weatherstrips	700S Black (Head & Jambs)	711	NGP
2	Brush Sweep	C697 Black	711	NGP

Set #8

3	Hinge	FBB179	631	BES
1	Storeroom Lockset	9K 4 7 D 15 C S3 PATD	622	BES
1	Construction Core	7190224	000	BES
1	Mounting Bracket	3750	600	ABH
1	Door Closer	EHD9016 AVB SDS90	693	BES
1	Kick Plate	PP0050 B4E CSK	622	ABH
1	Plate Threshold	8144 Smooth Side Up 10-24SSMS/LA	719	NGP
1	Set Adjustable Gaskets	107S Black (Head & Jambs)	711	NGP
1	Automatic Door Bottom	225S	628	NGP

NOTE: Template deadstop at 95 degrees.

Set #9

3	Hinge	FBB179	631	BES
1	Storeroom Lockset	9K 3 7 D 15 C S3 PATD	622	BES
1	Construction Core	7190224	000	BES
1	Door Closer	EHD9016 AVB AF90	693	BES
1	Kick Plate	PP0050 B4E CSK	622	ABH
1	Mop Plate	PP0050 B4E CSK	622	ABH
3	Silencer	AB608 Grey	000	ABH

Set #10

1	Continuous Hinge	671 HD UL SO	711	BES
1	Narrow Stile Lockset	8853.200.39L/2R	622	ACC
1	Mortise Cylinder	1E7 4 C258 B35103 PATD	622	BES
1	Construction Core	7190224	000	BES
1	Door Closer	TS9315 T CS	693	DKA
1	Wall Stop	AB409	622	ABH
1	Set Head & Jambs Weatherstrips	By Frame Manufacturer		

Set #11

3	Hinge	FBB191	622	BES
1	Privacy Indicator Lockset	45H 0 L 15 H VIBE O	622	BES
1	Door Closer	EHD9016 AVB SIS90	693	BES
1	Kick Plate	PP0050 B4E CSK	622	ABH
1	Mop Plate	PP0050 B4E CSK	622	ABH
3	Silencer	AB608 Grey	000	ABH

NOTE: Template stop at 95 degrees.

Set #12

3	Hinge	FBB179	631	BES
1	Privacy Indicator Lockset	45H 0 L 15 H VIBE O	622	BES
1	Door Closer	EHD9016 AVB AF90	693	BES
1	Kick Plate	PP0050 B4E CSK	622	ABH
1	Mop Plate	PP0050 B4E CSK	622	ABH

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1	Wall Stop	AB409	622	ABH
3	Silencer	AB608 Grey	000	ABH

Set #13

3	Hinge	FBB199 NRP	622	BES
1	Intruder Lockset	9K 3 7 IN 15 C S3 PATD	622	BES
2	Construction Core	7190224	000	BES
1	Door Closer	EHD9016 AVB SDS90	693	BES
1	Bumper Threshold	896S 10-24SSMS/LA	719	NGP
1	Set Bar Weatherstrips	700S Black (Head & Jambs)	711	NGP
1	Drip Sweep	C699 Black	711	NGP
1	Drip Cap	16 Black	711	NGP
1	Door Position Switch	MC4 Black	000	DKA

Set #14

3	Hinge	FBB199 NRP	622	BES
1	Storeroom Lockset	9K 3 7 D 15 C S3 PATD	622	BES
1	Construction Core	7190224	000	BES
1	Door Closer	EHD9016 AVB SDS90	693	BES
1	Bumper Threshold	896S 10-24SSMS/LA	719	NGP
1	Set Bar Weatherstrips	700S Black (Head & Jambs)	711	NGP
1	Drip Sweep	C699 Black	711	NGP
1	Drip Cap	16 Black	711	NGP
1	Door Position Switch	MC4 Black	000	DKA

Set #15

3	Hinge	FBB199 NRP	622	BES
1	Entrance Lockset	9K 4 7 AB 15 C S3 PATD	622	BES
1	Construction Core	7190224	000	BES
1	Mounting Bracket	3750	600	ABH
1	Door Closer	EHD9016 AVB SDS90	693	BES
1	Kick Plate	PP0050 B4E CSK	622	ABH
1	Plate Threshold	8144 Smooth Side Up 10-24SSMS/LA	719	NGP
1	Set Adjustable Gaskets	107S Black (Head & Jambs)	711	NGP
1	Automatic Door Bottom	225S	628	NGP

NOTE: Template deadstop at 95 degrees.

Set #16

3	Hinge	FBB191	622	BES
1	Passage Set	9K 4 0 N 15 C S3	622	BES
1	Door Closer	EHD9016 AVB SIS90	693	BES
1	Kick Plate	PP0050 B4E CSK	622	ABH
1	Plate Threshold	8144 Smooth Side Up 10-24SSMS/LA	719	NGP
1	Set Adjustable Gaskets	107S Black (Head & Jambs)	711	NGP
1	Automatic Door Bottom	225S	628	NGP

NOTE: Template deadstop at 95 degrees.

Set #17

3	Hinge	FBB191 NRP	622	BES
1	Entrance Lockset	9K 3 7 AB 15 C S3 PATD	622	BES
1	Construction Core	7190224	000	BES
1	Door Closer	EHD9016 AVB SDS90	693	BES
1	Kick Plate	PP0050 B4E CSK	622	ABH
1	Set Bar Weatherstrips	700S Black (Head & Jambs)	711	NGP

NOTE: Template deadstop at 90 degrees.

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Set #18

3	Hinge	FBB191 NRP	622	BES
1	Special Function Lockset	9K 3 7 DR 15 C S3 PATD	622	BES
2	Construction Core	7190224	000	BES
1	Door Closer	EHD9016 AVB SISH90	693	BES
1	Set Weatherstrips	161S Black (Head & Jambs)	711	NGP
1	Monitor Strike	MS14	000	DKA

NOTE: Template stop at 110 degrees.

Set #19

1	Cylinder	E Series x PATD as required	622	BES
1	Construction Core	7190224	000	BES

END OF SECTION

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SECTION 08 81 00 – GLAZING

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 DESCRIPTION

- A. Furnish all material, labor, equipment and services necessary for glazing of the building as indicated on the drawings and as described in this specification.

1.03 WORK SPECIFIED ELSEWHERE

Section 08 11 13 - Hollow Metal Doors and Frames
Section 08 14 16 - Flush Wood Doors
Section 08 41 00 - Aluminum Doors, Windows and Frames

1.04 SUBMITTALS

- A. Submit manufacturer's literature on each type of glass specified.

1.05 JOB CONDITIONS

- A. Obtain glass sizes from the work at the building or from the manufacturer of frames, sash, etc., in which the glass is to be set. Responsibility for correct glass sizes rests with Glass and Glazing Subcontractor.

1.06 STANDARDS

- A. Acceptable manufacturers for glass substrate: Vitro Architectural Glass, Guardian Industries Corp., Libby- Owens-Ford Co., PPG Industries, Inc., Glass Group and Saint-Gobain/Euroglass. Acceptable fabricators for laminated units are limited to: Viracon, Inc., Interpane Glass Co., Guardian Industries Corp., HGP/Tempglass Eastern, Inc. and Cardinal IG.
- B. Manufacturer of insulating glass shall warrant that insulating glass will not, for a period of ten years from date of manufacture, develop obstruction to vision due to film formation or dust collection due to failure of hermetic seal, and that all non-conforming glass will be replaced, but not installed, without cost to Owner.
- C. AFPC V2 2701.1 "Each light shall bear the manufacturer's label designating the type and thickness of glass." AFPC V2 2701.2 "Each unit of tempered glass shall be permanently identified by the manufacturer. The identification shall be etched or ceramic fired on the glass and be visible when the unit is glazed."

- D.** AFPC V2 2703.1 "Individual glazed areas in hazardous locations such as those indicated in 2703.2 shall pass the test requirements of 'Safety Standard for Architectural Glazing Materials Consumer Product Safety Commission (CPSC) 16 CFR 1201' or by comparative test shall be proven to produce at least equivalent performances." **EXCEPTIONS:**
1. Polished wire glass for use in fire doors, fire windows and view panels in 1-hr fire resistant walls and hazardous locations in 2703.2.1 (6) and 2703.2.1(7) shall comply with ANSI Z97.1.
 2. Approved plastic materials used as glazing in hazardous locations shall comply with ANSI Z97.1.
- E.** AFPC V2 2703.2.1. "The following shall be considered specific hazardous locations for the purposes of glazing:
1. Glazing in ingress and egress doors except wired glass in required fire doors and jalousies.
 2. Glazing in fixed and sliding panels of sliding (patio) door assemblies and panels in swinging doors.
 3. Glazing in storm doors.
 4. Glazing in all unframed swinging doors.
 5. Glazing in doors and enclosures for hot tubs, whirlpools, saunas, steam rooms, bathtubs and showers.
 6. Glazing in any portion of a building wall enclosing these compartments where the bottom edge of the glazing is less than 60 inches above the drain inlet.
 7. Glazing in an individual fixed or operable panel adjacent a door where the nearest vertical edge is within a 24" arc of the door in a closed position and whose bottom edge is less than 60" above the floor or walking surface.
 8. Glazing in an individual fixed or operable panel, other than those locations described in Items 5 and 6 above, that meets all of the following conditions:
 - a. Exposed area of an individual pane greater than 9 sq. ft.
 - b. Bottom edge less than 18" above the floor;
 - c. Top edge greater than 36" above the floor;
 - d. One or more walking surfaces within 36" horizontal of plane glazing;
 - e. All glazing in railings regardless of area or height above a walking surface including structural baluster panels and nonstructural in-fill panels."

PART 2 - PRODUCTS

2.01 MATERIALS

- A.** Insulating-Glass Units: Pre-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for class CBA units and requirements specified herein.
1. Provide Kind HS (heat strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of

individual glass lites and to comply with glass design requirements specified in "Performance Requirements" Article.

2. Provide Kind FT (fully tempered) where safety glass is indicated.
 3. Provide high performance low-emissivity coating on No. 2 surface. Min. performance requirements are implicit in products specified as the basis of design.
- B. 1" Insulated Unit: VITRO Architectural Glass. This glass is to be used at all exterior areas.
- | | |
|--|--|
| Exterior Lite: | 1/4" VITRO Solarban® 72 on Starphire (#2 |
| Surface) Low-E | |
| Interior Lite: | 1/4" VITRO Clear |
| 1/2" Cavity | Air (Standard) |
| Performance Characteristics | |
| Visible Light transmittance: | 32% |
| Exterior Reflectance: | 7% |
| Solar Heat Gain Coefficient: | 0.19 |
| Winter U-factor/U-Value (Btu/hr-ft²-F°): | 0.28 |
- C. 1/4" Clear Glass: VITRO Architectural Glass 1/4" clear float glass, or equal.
- D. 1/4" & 3/8" Clear Tempered Glass: VITRO Architectural Glass, 1/4" & 3/8" clear float Herculite Tongless Tempered Safety Glass, or equal.
- E. 3/16" Fire-Rated Glass: FireLite, fire-rated glass ceramic by TGP (Technical Glass Products), or equal.
- F. Setting Blocks: Neoprene, 70-90 durometer hardness.
- G. Spacers: Neoprene, 40-50 durometer hardness.
- H. Glazing Tape: Tremco, pre-shimmed 440 tape, or equal, 1/8" minimum.
- I. Sealant: Dow Corning 781, GE Silicone 1200 or other approved black acid-type silicone rubber elastomeric sealant.
- J. Silicone Glazing Sealant: Tremco Proglaze Silicone Sealant, or equal, translucent.
- K. Plate Glass Mirrors: Clear plate glass (FS DD-G-451), Type I, Class 1, quality g2, 1/4" thick with silver coating, copper protective coating and 2 mil thick paint coating, complying with CS27.
- L. Mirror Mastic: An adhesive setting compound for installation by spot application method with support only at the bottom edge.

- M. Architectural Window Film: Hanita Tek Window Films, Matte 2 mil translucent, install on glass where indicated on Drawings.

PART 3 - EXECUTION

3.01 INSTALLATION GENERAL

- A. Refer to the sections of these specifications containing references to other work which must be executed in conjunction with glass and glazing.
- B. Each glazing installation shall remain airtight and watertight under normal temperature change, wind loads and impact loads without failure or deterioration of glazing or glass.
- C. Protect glass from edge damage at all times during handling and installation.
- D. Do not attempt to cut, nip or abrade glass which is heat strengthened, tempered or coated.
- E. Remove and reset glazing beads without marring or defacing any portion of doors, windows, or beads. Clean glazing channel or framing immediately before glazing.
- F. Install setting blocks of proper size at quarter points of sill rabbet. Provide spacers, inside and out, for all glass larger than 50 united inches except at gasket glazing.
- G. Force sealant into channel to eliminate air pockets and voids and to ensure complete wetting of glass and channel surfaces. Tool exposed surfaces of sealants to provide "wash" away from glass surface. Clean and trim excess glazing material.
- H. Do not remove labels until glass and mirrors are inspected and approved by the Architect. Replace all breakage caused in executing the work or by faulty installation without cost to the Owner. Improperly set glass or glazing which does not fully meet the requirements of its grade will not be accepted. Such glass must be replaced without cost to the Owner.
- I. Clean all glass prior to final inspection.

3.02 LOCATION OF GLASS

- A. Each window, sidelight, frame, transom, and door with opening for glass shall be glazed with glass of the type indicated on the Drawings.

END OF SECTION

SECTION 09 21 16 - GYPSUM BOARD ASSEMBLIES

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. This Section includes the following:
 - 1. Non-load-bearing steel framing members for gypsum board assemblies.
 - 2. Gypsum board assemblies attached to steel framing.
 - 3. Cementitious backer units installed with gypsum board assemblies.
- B. Related Sections: The following Sections contain requirements that relate to this Section:

Section 05 40 00 - Cold-Form Metal Framing
Section 06 10 00 - Rough Carpentry

1.03 REFERENCES

- A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA-505 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.
- B. ASTM C 840, Standard Specification for Application and Finishing of Gypsum Board.
- C. GA-216, Gypsum Association Recommended Specification for Application and Finishing of Gypsum Board.

1.04 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of product specified.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum panels flat to prevent sagging.

1.06 PROJECT CONDITIONS

- A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C 840 requirements or gypsum board manufacturer's recommendations, whichever are more stringent.
- B. Room Temperatures: For non-adhesive attachment of gypsum board to framing, maintain not less than 40° F. For adhesive attachment and finishing of gypsum board, maintain not less than 50° F for 48 hours before application and continuously after until dry. Do not exceed 95° F when using temporary heat sources.
- C. Ventilation: Ventilate building spaces as required to dry joint treatment materials. Avoid drafts during hot, dry weather to prevent finishing materials from drying too rapidly.

PART 2 - PRODUCTS

2.01 STEEL FRAMING FOR WALLS AND PARTITIONS, FURRDOWNS AND CEILINGS

- A. General: Provide steel framing members complying with manufacturer's standard zinc protective coating.
- B. Steel Studs and Runners: ASTM C 645, with flange edges of studs bent back 90° and doubled over to form 3/16" wide min. lip (return), and complying with the following requirements for min. thickness of base (uncoated) metal and for depth:
 - 1. Thickness: 20 ga. unless otherwise indicated. 25 ga. Studs may be used at ceiling furrdowns.
 - 2. Thickness: 20 ga. for head runner, sill runner, jamb, and cripple studs at door and other openings unless noted otherwise.
 - 3. Thickness: As indicated.
 - 4. Depth: 3-5/8" unless otherwise indicated.
 - 5. Depth: 6" where indicated.
 - 6. Depth: As indicated.
- C. Deflection Track: Manufacturer's top runner complying with the requirements of ASTM C 645 and with 2" deep flanges for non-fire rated partitions where indicated on plans.
- D. Deflection and Firestop Track: Top runner designed to allow partition heads to expand and contract with movement of structure above while maintaining continuity of the assembly. Comply with requirements of ASTM C 645 except configuration, of thickness indicated for studs and width to accommodate depth of studs indicated with

h flanges offset at midpoint to accommodate gypsum board thickness. For fire rated partitions:

1. Offset Configuration: Shadow-line design with offset projecting out from depth of stud.
 2. Available Product: Subject to compliance with requirements, a product that may be incorporated in the Work includes, but is not limited to, "Fire Trak" manufactured by Fire Trak Corp. Furnish Fire Track-Slip Clips.
- E. Steel Rigid Furring Channels: ASTM C 645, hat shaped, depth and minimum thickness of base (uncoated) metal as follows:
1. Thickness: 25 ga. unless otherwise indicated.
 2. Depth: 7/8", 1-1/2", or as indicated on Drawings.
- F. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated.
- G. Drywall Control Joint: CEMCO 093 zinc control joint 7/16" deep with 1/4 opening control joint. Use where control joint is required in drywall walls and ceilings. Install at door and window heads locations susceptible to cracking.
- H. Drywall Ceiling Suspension System: Chicago Metallic Drywall Grid 640 from Rockfon. Provide fasteners, accessory pieces, wall angles and channels as required for complete installation.

2.02 GYPSUM BOARD PRODUCTS

- A. General: Provide gypsum board in widths of 48" and in maximum lengths available that will minimize end-to-end butt joints in each area indicated to receive gypsum board application.
- B. Gypsum Wallboard: ASTM C1396/C1396M and as follows:
1. Type: Regular for vertical surfaces, unless otherwise indicated.
 2. Type: Type X where required for fire-resistance-rated assemblies.
 3. Edges: Tapered.
 4. Thickness: 5/8" or as noted on the drawings.
- C. Gypsum Board Base Layer(s) for Multi-layer Applications: Gypsum wallboard, ASTM C1396/C1396M. Regular 5/8" thick for vertical surfaces, unless otherwise indicated.
- D. Moisture and Mold-Resistant Gypsum Board: ASTM C 1396/C1396M, with moisture and mold resistant core and paper surfaces.
1. Type: Georgia Pacific Gypsum Toughrock Mold-Guard Gypsum Board.
 2. Type: X where required for fire-resistance related assemblies.
 3. Edges: Tapered.

4. Thickness: 5/8" or as noted on the Drawings.
 5. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.
- E. Impact Resistant Gypsum Board: ASTM C1629.
1. Type: Georgia Pacific Gypsum, DensArmor Plus Abuse-Resistant Panel
 2. Edges: Tapered
 3. Thickness: 5/8"

2.03 TRIM ACCESSORIES

- A. Accessories for Interior Installation: Cornerbead, edge trim, and control joints complying with ASTM C 1047. Formed steel sheet zinc coated by hot-dip process or rolled zinc.
1. Shapes indicated below by reference to Fig. 1 designations in ASTM C 1047:
 - a. Cornerbead on outside corners, unless otherwise indicated.
 - b. LC-bead with both face and back flanges; face flange formed to receive joint compound. Use LC-beads for edge trim, unless otherwise indicated.
 - c. One-piece control joint formed with V-shaped slot and removable strip covering slot opening.

2.04 JOINT TREATMENT MATERIALS

- A. General: Provide joint treatment materials complying with ASTM C 475 and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.
- B. Joint Tape for Gypsum Board: Paper reinforcing tape, unless otherwise indicated. Use pressure-sensitive or staple-attached, open-weave, glass-fiber reinforcing tape with compatible joint compound where recommended by manufacturer of gypsum board and joint treatment materials for application indicated.
- C. Joint Tape for Cementitious Backer Units: As recommended by cementitious backer unit manufacturer.
- D. Drying-Type Joint Compounds for Gypsum Board: Factory-packaged vinyl-based products complying with the following requirements for formulation and intended use.
1. Ready-Mixed Formulation: Factory-mixed product.
 - a. Taping compound formulated for embedding tape and for first coat over fasteners and face flanges of trim accessories.
 - b. Topping compound formulated for fill (second) and finish (third) coats.
 - c. All-purpose compound formulated for both taping and topping compounds.

2.05 ACOUSTICAL SEALANT

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C 834 and the following requirements:
- B. Acoustical Sealant for Concealed Joints: Manufacturer's standard nondrying, non-hardening, non-skinning, non-staining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound.

2.06 MISCELLANEOUS MATERIALS

- A. General: Provide auxiliary materials for gypsum board construction that comply with referenced standards and recommendations of gypsum board manufacturer.
- B. Spot Grout: ASTM C 475, setting-type joint compound recommended for spot-grouting hollow metal door frames.
- C. Steel drill screws complying with ASTM C 1002 for the following applications:
 - 1. Fastening gypsum board to steel members less than 0.033" thick.
 - 2. Fastening gypsum board to wood members.
 - 3. Fastening gypsum board to gypsum board.
- D. Steel drill screws complying with ASTM C 954 for fastening gypsum board to steel members from 0.033" to 0.112" thick.
- E. Steel drill screws of size and type recommended by unit manufacturer for fastening cementitious backer units.
- F. Gypsum Board Nails: ASTM C514.
- G. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), non-perforated.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates to which gypsum board assemblies attach or abut, installed hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLING STEEL FRAMING, GENERAL

- A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.
- B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with United States Gypsum Co.'s "Gypsum Construction Handbook."
- C. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement. Comply with details shown on Drawings.
 - 1. Where building structure abuts ceiling perimeter or penetrates ceiling.
 - 2. Where partition framing and wall furring abut structure, except at floor.
 - a. Install deflection track top runner to attain lateral support and avoid axial loading for non-rated assemblies.
 - b. Install deflection and firestop track top runner at fire-resistance-rated assemblies where indicated. Attach jamb studs at openings to tracks using manufacturer's standard stud clip.
- D. Do not bridge building control and expansion joints with steel framing or furring members. Independently frame both sides of joints with framing or furring members as indicated.

3.03 INSTALLING STEEL FRAMING FOR WALLS AND PARTITIONS

- A. Install runners (tracks) at floors, ceilings, and structural walls and columns where gypsum board stud assemblies abut other construction. Where studs are installed directly against exterior walls, install asphalt felt strips or foam gaskets between studs and wall.
- B. Installation Tolerances: Install each steel framing and furring member so that fastening surfaces do not vary more than 1/8" from the plane formed by the faces of adjacent framing.
- C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
 - 1. Cut studs 1/2" short of full height to provide perimeter relief.
 - 2. For STC-rated and fire-resistance-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid structural surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed, to support gypsum board closures needed to make partitions continuous from floor to underside of solid structure.

- D. Install steel studs and furring in sizes and at spacings indicated.
 - 1. Single-Layer Construction: Space studs 16" o.c., unless otherwise indicated.
 - 2. Multi-layer Construction: Space studs 24" o.c., unless otherwise indicated.
- E. Install steel studs so flanges point in the same direction and leading edge or end of each gypsum board panel can be attached to open (unsupported) edges of stud flanges first.
- F. Frame door openings to comply with GA-219, and with applicable published recommendations of gypsum board manufacturer, unless otherwise indicated. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs. Install two studs at each jamb, unless otherwise indicated. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2" clearance from jamb stud to allow for installation of control joint.
- G. Frame openings, other than door openings, to comply with details indicated or, if none indicated, as required for door openings. Install framing below sills of openings to match framing required above door heads.

3.05 APPLYING AND FINISHING GYPSUM BOARD, GENERAL

- A. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C 840 and GA-216.
- B. Install sound-attenuation blankets, where indicated, prior to installing gypsum panels unless blankets are readily installed after panels have been installed on one side.
- C. Install gypsum panels with face side out. Do not install imperfect, damaged, or damp panels. Butt panels together for a light contact at edges and ends with not more than 1/16" of open space between panels. Do not force into place.
- D. Locate both edge or end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Avoid joints other than control joints at corners of framed openings where possible.
- E. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- F. Attach gypsum panels to framing provided at openings and cutouts.
- G. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Instead, float gypsum panels over these members using resilient channels or provide control joints to counteract wood shrinkage.
- H. Spot grout hollow metal door frames for solid-core wood doors, hollow metal doors, and doors over 32" wide. Apply spot grout at each jamb anchor clip and immediately insert gypsum panels into frames.

- I. Form control and expansion joints at locations indicated and as detailed, with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels. Maximum spacing between control joints shall not exceed 30'-0".
- J. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases that are braced internally.
 - 1. Except where concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect open concrete coffer, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffer, joists, and other structural members; allow 1/4" to 3/8" wide joints to install sealant.
- K. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except floors, as detailed. Provide 1/4"- to 1/2" wide spaces at these locations and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- L. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations. Space screws a maximum of 12" o.c. for vertical applications.

3.06 GYPSUM BOARD APPLICATION METHODS

- A. Single-Layer Application: Install gypsum wallboard panels as follows:
 - 1. On furred downs, apply gypsum panels prior to wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated, and provide panel lengths that will minimize end joints. Stagger abutting end joints not less than one framing member in alternate courses of board.
- B. Multi-layer Application on Partitions/Walls: Apply gypsum board indicated for base layers and gypsum wallboard face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints. Stagger joints on opposite sides of partitions.
- C. Single-Layer Fastening Methods: Apply gypsum panels to supports by fastening with screws.
- D. Multi-layer Fastening Methods: Apply base layers of gypsum panels and face layer to base layers by fastening both base layers and face layers separately to supports with screws.

3.07 INSTALLING TRIM ACCESSORIES

- A. General: For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.
- B. Install cornerbead at external corners.
- C. Install edge trim where edge of gypsum panels would otherwise be exposed. Provide edge trim type with face flange formed to receive joint compound, except where other types are indicated.
- D. Install control joints according to ASTM C 840 and manufacturer's recommendations and in specific locations approved by Architect for visual effect.

3.08 FINISHING GYPSUM BOARD ASSEMBLIES

- A. General: Treat gypsum board joints, interior angles, flanges of cornerbead, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.
- B. Apply joint tape at joints between gypsum boards, except where a trim accessory is indicated.
- C. Apply treatment at gypsum board joints (both directions), flanges of trim accessories, penetrations, fastener heads, surface defects and elsewhere as required to prepare work for decoration. Pre-fill open joints and rounded or beveled edges, using type of compound recommended by manufacturer.
- D. Apply joint compound in 3 coats (not including pre-fill of openings in base), and sand between last 2 coats and after last coat.
- E. For treatment of joints in glass mat, water-resistant gypsum board, comply with directions of gypsum board manufacturer.
- F. Finish cementitious backer units to comply with unit manufacturer's directions.
- G. Joints in partitions which are above ceilings shall be taped and made smoke tight.

3.09 CLEANING AND PROTECTION

- A. Promptly remove any residual joint compound from adjacent surfaces.
- B. Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure gypsum board assemblies are without damage or deterioration at the time of Substantial Completion.

END OF SECTION

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SECTION 09 30 13
CERAMIC PORCELAIN TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. See Section 093050 Tile Setting Accessories

1.2 SUMMARY

- A. Section Includes:
 - 1. Porcelain Tile
 - 2. Ceramic Tile
 - 3. Thresholds

1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. Module Size: Actual tile size plus joint width indicated.
- C. Face Size: Actual tile size, excluding spacer lugs.
- D. Wet Area: Tile surfaces that are either soaked, saturated, or regularly and frequently subjected to moisture or liquids (including water), such as gang showers, tub enclosures, showers, laundries, saunas, steam rooms, swimming pools, hot tubs, and exterior areas.

1.4 PERFORMANCE REQUIREMENTS

- A. Dynamic Coefficient of Friction (DCOF): For tile installed on level interior walkways designed to bear surface traffic when wet per Section 9 of ANSI A137.1-2012 standard for ceramic tile:
 - 1. DCOF Wet Area: Minimum 0.42 per DCOF AcuTestSM

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Manufacturer's printed handling and storage instructions
 - 2. Manufacturer's printed mixing instructions
 - 3. Manufacturer's printed installation instructions.
- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.
 - 1. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 12 inches square, but not fewer than 4 tiles. Use grout of type and in color or colors approved for completed Work.
 - 2. Grout: Submit manufacturer's full range of standard and designated color samples.
- D. Product Certificates: For each type of product, signed by product manufacturer.

- E. Material Test Reports: For each tile-setting and -grouting product.
- F. Qualification Data: For qualified Installer.

1.6 QUALITY ASSURANCE

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from one source or producer.
 - 1. Obtain tile of each size, type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
 - 1. Thresholds.
 - 2. Waterproof membrane.
 - 3. Crack isolation membrane.
 - 4. Joint sealants.
 - 5. Metal edge strips.
- D. Pre-installation Conference: Conduct pre-installation conference at the site.
 - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.
- E. Mockups: Build mockups as indicated on Drawings or as indicated below to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup of a 2x3 area of each tile to be incorporated into the Work if approved.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.
- E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.9 EXTRA MATERIALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 2 percent of amount installed for each type, composition, color, pattern, and size indicated but not less than three boxes for each tile.

PART 2 - PRODUCTS

2.1 GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
 - 1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

2.2 MANUFACTURER

- A. Acceptable Manufacturer: Trinity Tile; 115 SW 49th Avenue; Ocala, Florida 34474
 - 1. Substitutions: In accordance with Division 1 Section "Substitution Procedures."

2.3 TILE

- A. PWT 1 / PFT 1 – Porcelain Wall and Floor Tile
 - 1) Composition: Porcelain wall and floor tile
 - 2) Module Size:
 - a) 12" x 24"
 - 3) Trim Tile: N/A
 - 4) Color: Daltile, Linden Point, Bianco (LP19)
 - 5) Water Absorption: .1%
 - 6) Coefficient of Friction:
 - a) .52
 - 7) Frost Resistance: Resistant per ASTM C1026.
 - 8) Breaking strength: greater than 401 lbf
 - 9) Chemical resistance per ASTM C-650: Class A
- B. PWT 2 – Porcelain Wall Tile

- 1) Composition: Porcelain wall tile
 - 2) Module Size:
 - a) 12" x 24"
 - 3) Trim Tile: N/A
 - 4) Color: Daltile, Linden Point, Grigio (LP21)
 - 5) Water Absorption: .1%
 - 6) Coefficient of Friction:
 - a) .52
 - 7) Frost Resistance: Resistant per ASTM C1026.
 - 8) Breaking strength: greater than 401 lbf
 - 9) Chemical resistance per ASTM C-650: Class A
- C. PWT 3 – Porcelain Wall Tile (Backsplash)
- 1) Composition: Porcelain wall tile
 - 2) Module Size:
 - a) 12" x 12" – Navy Straight Joint
 - 3) Trim Tile: Jolly – ½ x 12
 - 4) Color: Daltile, Navy K189

2.4 THRESHOLDS

- A. Provide Schluter Reno-TK or equal at tile to carpet transition.
- B. Provide Schluter Reno-U or equal at tile to concrete transition.

2.5 WATERPROOF SUBSTRATE

- A. Install tile over waterproof substrate.

2.6 GROUT MATERIALS

- A. Standard Cement Grout: ANSI A118.6.-verify with Architect
 - B. Water-Cleanable Epoxy Grout: ANSI A118.3[, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D].- verify with architect
1. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 deg F and 212 deg F, respectively, and certified by manufacturer for intended use.

2.7 ELASTOMERIC SEALANTS

- A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Division 07 Section "Joint Sealants."
 1. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.
- B. Multipart, Pourable Urethane Sealant for Use T: ASTM C 920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, O.

2.8 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, Portland cement-based formulation provided or approved by manufacturer of tile-setting materials for

installations indicated.

- B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications.

- 1. Basis of Design: Schluter – JOLLY.

- C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- D. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.

2.9 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - 1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 2. Verify that concrete substrates for tile floors installed with thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a) Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b) Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 - 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 - 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 TILE INSTALLATION

- A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 - 1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
 - a) Tile floors in wet areas.
 - b) Tile floors composed of tiles 8 by 8 inches or larger.
 - c) Tile floors composed of rib-backed tiles.
 - B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
 - C. 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 plates, collars, or covers overlap tile.
 - D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
 - E. Jointing Pattern: **Lay tile in stacked bond pattern. Coordinate tile pattern with Architect prior to installation.** Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile, or as otherwise indicated on Drawings. Provide uniform joint widths unless otherwise indicated. **Tile joints to line up precisely from floor to wall.**
 - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
 - 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 - 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
 - F. Joint Widths:
 - 1. 1/8" typical
 - G. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
 - 2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

- H. Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
- I. Metal Edge Strips: Install in locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile or where there is an exposed edge.
- J. Grout Sealer: Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove Latex-Portland cement grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
 - 3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.
- B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.5 TILE INSTALLATION SCHEDULE

- A. Interior Floor Installations, Concrete Subfloor:
 - 1. Tile Installation F115: Thin-set mortar; epoxy grout.
 - a) Thin-Set Mortar: Latex-Portland cement mortar.
 - b) Grout: Water-cleanable epoxy grout.
- B. Interior Wall Installations, on Studs or Furring:
 - 1. Tile Installation : Thin-set mortar on coated glass-mat, water-resistant gypsum backer board.
 - a) Thin-Set Mortar: Latex-Portland cement mortar.
 - b) Grout: Polymer-modified sanded Polymer-modified unsanded Water-cleanable epoxy grout.

END OF SECTION

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SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

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. This Section includes: Lay-In Acoustical Board Ceilings.

1.03 SUBMITTALS

- A. Product Data: For each type of product specified.
- B. Samples: For each type of product specified.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed acoustical panel ceilings similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Flame spread rating for acoustical lay-in panels shall be 25 or less when tested in accordance with ASTM E-84.
- C. Ceiling installation shall comply with requirements for seismic lateral support as required by SBC1607.6.3.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels and suspension system components 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 panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.06 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is complete and dry, work above cei

lings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.07 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, VAC equipment, fire-suppression system, and partition assemblies.

1.08 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
 - 1. Acoustical Ceiling Units: Full-size units equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS

2.01 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements.
- B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
- C. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung, unless otherwise indicated.
- D. Wire Hangers, Braces, and Ties: Provide #12 gage Carbon-Steel Wire, ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
- E. Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.
- F. Lay-in Acoustical Board Ceilings:
 - 1. Lay-in Acoustic Board "A": Armstrong Optima Tegular, #3354, 24" x 24" x 1", Class A fire resistant. Color to be White. Grid to be Armstrong Prelude 15/16" Dimensional Tee System. Wall molding shall be Armstrong 7/8" hemmed angle molding, or equal.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine substrates and structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage, and other conditions affecting performance of acoustical panel ceilings. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.03 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with publications referenced below per manufacturer's written instructions and Cisca's "Ceiling Systems Handbook."
 - 1. Cisca's Recommendations for Acoustical Ceilings: Comply with Cisca's "Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings-- Seismic Zones 0-2."
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions and where structural members exceed a 4'-0" spacing; offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
 - 3. Install 4 hangers at each recessed fluorescent light fixture installed near each corner, installed by the ceiling Contractor.
 - 4. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
 - 5. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure; that are appropriate for substrate; and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 6. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other dev

ices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.

7. Do not attach hangers to steel deck tabs.
 8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 9. Space hangers not more than 48" o.c. along each member supported directly from hangers, unless otherwise indicated; and provide hangers not more than 8" from ends of each member.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area.
1. Screw attach moldings to substrate at intervals not more than 16" o.c. and not more than 3" from ends, leveling with ceiling suspension system to a tolerance of 1/8" in 12'. Miter corners accurately and connect securely.
 2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
- G. Where cleanouts, valves, or other operating equipment which must be serviced is located above a suspended ceiling, the panels directly below equipment shall be marked with a colored map pin near one corner of the panel.

3.04 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09 53 23
ACCOUSTICAL CEILING SUSPENSION SYSTEMS

1.1 SUMMARY

- A. Section Includes: Provide metal suspension system for acoustical panel ceilings including but not limited to:
 - 1. exposed metal suspension systems for acoustical panel ceilings.

1.2 REFERENCES

- A. Abbreviations and Acronyms:
 - 1. CISCA: Ceilings & Interior Systems Construction Association; www.cisca.org.
- B. Reference Standards:
 - 1. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated(Galvanized) or Zinc-Iron Alloy-Coated Galvannealed by the Hot-Dip Process
 - 2. ASTM C635/C635M Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
 - 3. ASTM C636/C636M Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels
 - 4. ASTM C754 Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products
 - 5. ASTM C841 Standard Specification for Installation of Interior Lathing and Furring

1.3 SUBMITTALS

- A. Product Data: Submit sheets listing dimensions, load carrying capacity and standard compliance.
- B. Samples: Submit samples of main tee and cross tee with couplings.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Supply additional material equal to []% of ceiling area. Additional material should match products installed and have the appropriate labels and identification.
- B. Supply extra materials that match Products installed and are packaged with protective covering for storage and identified with labels describing contents.

1.5 QUALITY ASSURANCE

- A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect system components from excessive moisture in shipment, storage, and handling. Deliver in unopened bundles and store in a dry place with adequate air circulation. Do not deliver material to building until wet conditions such as concrete, plaster, paint, and adhesives have been completed and cured to a condition of equilibrium.

1.7 WARRANTY

- A. Manufacturer Warranty: Submit a written warranty executed by manufacturer for a period of 40 years from date of Substantial Performance, agreeing to repair or replace suspension system components that fail or are compromised within the specified warranty period. Failed or compromised parts can include, but are not limited to:
 - 1. Rusting or defects directly made by the manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Chicago Metallic Double Web [Intermediate] [Heavy] Duty Non-Fire Rated Ceiling Suspension System manufactured by ROCKFON, 4849 South Austin Avenue, Chicago, IL 60638. 1-800-323-7164; www.rockfon.com.

2.2 MATERIALS

- A. Basic Steel Material and Finish: Commercial quality, CS Type A to ASTM A653/A653M, hot-dip galvanized to not less than Z275 (G90 zinc coating designation).
- B. Main Tees and Cross Tees: All suspension main tee and cross tee components are manufactured from commercial quality steel with factory punched cross tee slots, hanger holes, and integral bayonet-style end couplings. The main tees are capped with steel capping affixed to a flange and is coated with factory applied baked-on enamel paint.
 - 1. Structural Classification Standard: ASTM C635/C635M Heavy Duty.
 - 2. Colour: Standard white unless otherwise noted.
 - 3. Specified Product: "Chicago Metallic 200 Snap-Grid™ (15/16) Exposed" by ROCKFON.
- C. Perimeter Treatment Components:
 - 1. Angle Moldings: Manufactured from 0.530 mm (0.020") thick steel and finished identical to main tees and cross tees.
 - 2. Channel Moldings: Manufactured from 0.455 mm (0.018") thick steel with factory applied standard white baked-on enamel paint finish.
 - 3. Shadow Line Moldings: Manufactured from 0.530 mm (0.020") thick steel with 19 mm (3/4") and 9 mm (3/8") hemmed edge and finished with factory applied standard baked-on enamel paint.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas and conditions, including structural framing to which metal acoustical ceiling suspension assemblies attach or abut, with installer present, for compliance with requirements specified in this and other Sections affecting ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of metal acoustical ceiling suspension assemblies.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install metal acoustical ceiling suspension assemblies to comply with ASTM C636/C636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Main Tees: Installed 1220 mm 48" on centre, by direct suspension from existing structure in accordance with ASTM C754 and ASTM C841 with not less than 2.642 mm (12 ga min) steel hanger wires, wrapped tightly 3 full turns, spaced 1220 mm 48" on centre along component length.
- C. Cross Tees:
 - 1. Installed perpendicular to main tees 610 mm (24") on centre to form 2 by 2 modules.
 - 2. Installed adjacent to each unsupported side of recessed fixtures.
- D. Shadow Line Moldings: Installed on vertical surfaces, intersecting suspension components by appropriate method in accordance with industry accepted practice.
- E. Additional Hanger Wires: Wrapped tightly 3 full turns to structure and components at locations where imposed loads could cause deflection exceeding 1/360 span.
- F. Lighting fixtures installed shall not rely on ceiling grid for support. Fixtures shall be independently supported by 12 ga min. wire tied to structure at diagonal ends.

3.3 REPAIR

- A. Remove damaged or compromised components; replace with undamaged components.

END OF SECTION

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SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 DESCRIPTION

- A. The extent of resilient base is shown on the Drawings. Related work specified elsewhere includes:

Section 03 30 00 - Cast-In-Place Concrete

1.03 SUBMITTALS

- A. Submit materials list and manufacturer's technical data.
- B. Submit current set of samples to the Architect for selection of colors to be used.

1.04 PROJECT CONDITIONS

- A. Maintain minimum temperature of 65° F in spaces to receive resilient base for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. Store resilient base materials in spaces where it will be installed for at least 48 hours before beginning installation. Subsequently, maintain minimum temperature of 55° F in areas where work is completed.
- B. Install resilient base after flooring installation is complete.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Vinyl base - top set cove, 4" high, 1/8" thick, furnish in roll stock (not 48" lengths) at all locations. Color as selected by Architect. Acceptable manufacturers include Flexco, Roppe, Tarkett/Johnsonite and Mannington, or equal.
- B. Adhesives (Cements) - waterproof, stabilized type as recommended by manufacturer. Asphalt emulsions and other non-waterproof types not acceptable.

2.02 INSPECTION

- A. The Installer must examine the substrate and the conditions under which resilient base is to be installed. Notify the Contractor in writing of any unsatisfactory conditions. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Apply resilient base to walls and other permanent fixtures in rooms where base is required. Install base in as long lengths as practicable, with corners fabricated from base material. Form external corners by heating base and bending it around the corner, with joints not less than 8" from the corner. Form internal corners by notching cove and bending base into corner to form a continuous vertical surface.
- B. Tightly bond base to backing throughout the length of each piece, with continuous contact at horizontal and vertical surfaces.

3.02 CLEANING

- A. Upon completion of resilient base installation, immediately remove any excess adhesive from base or adjacent surfaces using appropriate cleaner recommended by the resilient base manufacturer.

END OF SECTION

SECTION 096813 MODULAR FLOORING FOR COMMERCIAL APPLICATION

PART 1 GENERAL

1.01 THIS SECTION INCLUDES

A. Textile composite flooring modules as shown on the drawings and schedules and as indicated by the requirements of this section.

1.02 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract (including General and Supplementary Conditions and Division 1 sections) apply to the work in this section only.

1.03 RELATED SECTIONS

- A. Other Division 9 sections for floor finishes related to this section but not the work of this section.
- B. Division 3 Concrete - not included work this section.
- C. Division 6 Wood and Plastics - not included work this section.
- D. Division 7 Thermal and Moisture Protection - not included work this section.

1.04 QUALITY ASSURANCE AND REGULATORY REQUIREMENTS

- A. Qualifications of flooring installation contractor: All work shall be done by installation firms specializing in commercial flooring and carpet installation. It is required, that the firm or individual shall be a member of the Floor Covering Installation Contractors Association (FCICA) and/or certified by the Certified Floorcovering Installers Association (CFI). Flooring contractor to be specialty contractor normally engaged in this type of work and shall have three (3) years minimum documented experience in commercial installation of similar flooring materials and participation in manufacturer's environmental program including responsible flooring removal, recycling, and installation.
- B. Flooring contractor will be responsible for the proper product installation, including floor preparation in all the areas indicated in the drawings to receive Kinetex modules. The installation standard will be as listed in J+J Flooring Kinetex Installation Instructions.
- C. Flooring contractor to provide owner a written warranty that guarantees the completed installation to be free from defects in materials and workmanship for a period of no less than two (2) years after job completion.
- D. Manufacturer qualifications: Manufacturing facility to ISO 14001 certified and have a minimum of 20 years experience in the manufacture of commercial flooring.
- E. Manufacturer to offer a reclamation program for the recycling of existing broadloom carpet, modular carpet tile and textile composite flooring.
- F. All warranties must be issued by the manufacturer as standard published warranties on all

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types of flooring modules within this document. Second source warranties that involve parties other than the textile composite flooring manufacturer are unacceptable. If the product fails to perform as warranted when installed according to the J+J Flooring's Kinetex installation instruction and maintained according to J+J Flooring's Kinetex maintenance instructions, the affected area will be repaired or replaced at the expense of the manufacturer. J+J Flooring will provide standard published written performance warranties for the following:

1. Lifetime product performance. Will not delaminate along seams or lose more than five (5%) percent by weight of fiber during its useful life.
2. Lifetime static propensity, meaning built-in protection below 3.0 kv as tested under AATCC-134.
3. Lifetime Stain Removal
4. Lifetime Colorfastness (Light and Crocking)

G. Manufacturer to provide field service experts to assist in project start-up as required by the job and will notify owner, architect, general contractor, or another designated contact if any installation instructions are not followed.

H. Provide flooring material to meet the following test performance criteria as tested by a recognized independent testing laboratory. Certified test reports shall be submitted by the manufacturer for each test method. Requirements listed below must be met by all products being submitted for approval:

1. Pill Test / DOC-FF-1-70 (ASTM D-2859) - Requirement: Pass
2. Flooring Radiant Panel / ASTM E-648 - Requirement: Class I (Above .45 w/cm)
3. CRI VOC Chamber Test/Indoor Air Quality test (CRI-IAQ) Green Label Plus™ Test.
4. Lightfastness: Rating of not less than 5 on International Grey Scale after 40 SFU's when tested in accordance with AATCC Test Method 16.3.
5. Crockfastness: Minimum stain rating on International Grey Scale of not less than 5 wet or dry when tested in accordance with AATCC Test Method 165.
6. Atmospheric Fading: Burned Gas shall not be less than 5 on International Grey Scale after two cycles on each test as per AATCC Test Method 129 Ozone and AATCC Test Method 23.
7. Noise Reduction Coefficient (ASTM C 423-02): NRC Rating of 0.30
8. Impact Insulation Classification (ASTM E 492-09): IIC Rating of 64
9. Slip Resistance (ASTM 1028-96): Complies with ADA Guidelines for level surface
10. Thermal Insulation (ASTM C 518): R. 73

1.05 SUBMITTALS

A. Submit to architect and/or owner ten (10) days prior to bid, two (2) 6.5" x 6.5" (minimum size) finished samples of the exact type of flooring proposed, including quality, pattern, color and backing.

B. Submit to architect and/or owner ten (10) days before bid, any proposed substitutions for consideration. Submit at least three (3) references of installations using the same flooring technology, as described within this text. Include contact names and telephone numbers.

C. Submit manufacturer's warranties, installation instructions, and maintenance instructions before bid date.

D. Submit the manufacturer's certification that the flooring has been tested by an independent

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laboratory and complies with the required flammability tests as well as other testing requirements as listed under 1.04 F.

1.06 ENVIRONMENTAL/FIELD CONDITIONS

- A. Deliver all materials to the installation site in the manufacturer's original packaging and in good condition. Packaging to contain manufacturer's name and marks, identification number, shipping and handling instructions and related information.
- B. Delivered and stored materials must be available for inspection as required by the owner, architect, general contractor and/or the manufacturer.
- C. Sub-floor preparation is to include all required work to prepare the existing floor for installation of the product as specified in this document. Sub-floor preparation shall meet all conditions as specified in J+J Flooring's Kinetex textile composite flooring installation instructions.
- D. Sub-floor preparation will include, as required, the removal and repair of the existing floor surface. It is required that the floor of a renovation project be inspected before the bid date.
- E. All materials, including adhesives, are to be delivered to the site of installation at a minimum of 48 hours prior to the start of installation and stored in a clean and dry room that measures above 65°F and below 95°F and measures between 10% and 65% relative humidity (RH). To maintain temperature and relative humidity, permanent heating and air conditioning systems (HVAC) must be in operation. Place pallets of textile composite flooring modules on a flat surface (do not double stack pallets). After work is completed, the ambient room temperature should remain at 65°F and relative humidity between 10% and 65% for 48 hours. These materials and related adhesives shall be protected from the direct flow of heat from heating fixtures and appliances such as hot-air registers, radiators, or other. Site conditions shall include those specified in the flooring manufacturer's installation instructions and shall also include sufficient heat, light and power required for effective and efficient working condition.
- F. Once the temperature and relative humidity in area for installation have been stabilized, loose lay the modules within the installation area and allow them to precondition for 48 hours prior to installation. Module installation shall not commence until painting and finishing work is complete and ceiling and overhead work is tested, approved and completed. Traffic shall be closed during the installation of the textile composite flooring products. Verify concrete slabs are dry per the standards for bond and moisture tests listed in the manufacturer's installation instructions.

1.07 SUBSTITUTIONS

- A. All Bid submittals must conform to the specifications in this document.
- B. All test results to be in accordance with a certified independent testing laboratory.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturer: Kinetex, a brand of J+J Flooring, P.O. Box 1287, Dalton, GA, 30722. (800) 241-4586. JJFLOORINGGROUP.COM. Please contact BRAD BUNCH, (479) 305-4004, brad.bunch@jjflooringgroup.com

Any alternate manufacturer and/or product must meet or exceed those requirements specified under all sections of this document in pattern, color, and fiber. Any substitutions must be made in accordance with Section 1.00 of this document.

2.02 TEXTILE COMPOSITE FLOORING MATERIALS

A. CPT 1 Kinetex flooring modules (tiles):

1. Product: Catalyst 1841
2. Color: Launch 2843
3. Backing: Kinetex Felt Cushion
4. Dye Method: Solution Dyed
5. Wear Layer: 100% Polyester
6. Total Weight (Nominal Average): 4.5 oz - 5.2 oz / square foot
7. Pattern Repeat: N/A
8. Soil Release: Yes
9. Standard Size: 24" x 24" (approx. (60.96cm x 60.96 cm)
10. Warranties: Lifetime Product Performance, Colorfastness to Light & Crocking, Stain Removal, Static Protection, Protection from Edge Ravel and Delamination Failure; Lifetime Dimensional Stability.
11. Testing Specifications - Pill Test: Yes
12. Testing Specifications - Flooring Radiant Panel: Class 1
13. Testing Specifications - Smoke Density: Less than 450.0 flaming (ASTM E 662)
14. Testing Specifications - Static Test: Less than 3.0kv (AATCC-134)
15. Recycled content: Minimum of 47% recycled content
16. NSF/ANSI 140 Platinum Certified
17. Closed-loop recyclable

B. WM Walk off Carpet Tile:

1. Product: Incognito Walk-off Modular 7069 manufactured by J&J Flooring
2. Color: Operative 1837
3. Construction: Textured Patterned Loop
4. Backing: Nexus® Modular
5. Dye Method: Solution Dyed
6. Fiber Type: Encore® SD (with recycled content)
7. Face Weight: 29 oz./sy. (983 grams/m²)
8. Pile Density: 8717 oz./y³. (323.23 kg/m³)
9. Gauge: 1/12 (4.72 rows/cm)
10. Stitches: 12.00 stitches/in (4.72 stitches/cm)
11. Pattern Repeat: N/A
12. Soil Release: Yes
13. Stain Resistance: Yes
14. Bleach Resistance: Yes
15. Optional Treatments: Yes
16. Standard Size: 24" x 24" (approx. (60.96cm x 60.96 cm)

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17. Warranties: Lifetime Fiber Performance for Wear, Lifetime for Tuft Bind Strength (edge ravel, yarn pulls, zippering), Lifetime Protection from Delamination Failure, Lifetime Fiber Performance for Static, Lifetime Colorfastness to Atmospheric Contaminants, Lifetime Stain Removal
18. Testing Specifications - Pill Test: Yes
19. Testing Specifications - Flooring Radiant Panel: Class 1
20. Testing Specifications - Smoke Density: Less than 450.0 flaming (ASTM E 662)
21. Testing Specifications - Static Test: Less than 3.0kv (AATCC-134)
22. Testing Specifications - Lightfastness Test: 1

2.03 ADHESIVES

- A. Kinetex® Adhesive, an aggressive, pressure-sensitive adhesive designed for the installation of Kinetex textile composite flooring modules is required.
- B. Commercialon® Premium Modular Pressure Sensitive Adhesive, a premium modular flooring adhesive specifically formulated for bonding J+J Flooring's Nexus® Modular PVC backed carpet to the floor.
- C. TileTabs® Connectors for Nexus® backed carpet tiles. A glue-free installation which eliminates the need for full spread adhesive which requires drying time. TileTabs® provide an adhesive-free installation and comply with CRI Green Label Plus (zero calculated emissions).

2.04 ACCESSORIES

- A. Kinetex requires protective transition 3/16-inch to other floor covering thickness. Provide transition/reducing strips tapered to meet abutting materials as indicated in the drawings.
- B. Provide aluminum edge with lip to protect Kinetex edge.
- C. Provide edge strips made of extruded aluminum with a mill finish, unless otherwise noted.

PART 3 EXECUTION

3.01 INSPECTION

- A. Examine and verify that sub-floor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive installation of modules.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive installation of modules.
- C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.
- D. Verify that concrete sub-floor surfaces are dry enough and ready for flooring installation by testing for moisture emission rate and alkalinity in accordance with ASTM F 710; obtain instructions if test results are not within limits recommended by J+J Flooring.
- E. Verify that required floor-mounted utilities are in correct location.

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F. J+J Flooring requires that Kinetex textile composite flooring be inspected prior to installation for proper style, color and potential defects. No claims will be honored if the modules are installed with visible defects. Should there be a problem, call J+J Flooring's Customer Relations Department at 800.241.4586.

3.02 PREPARATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. SURFACE PREPARATION- Dust, dirt, debris and non-compatible adhesive must be removed before the installation begins. Surfaces must be smooth and level with all holes and cracks filled with Portland cement-based patch reinforced with polymers. Kinetex Adhesive cannot be applied to any substrate where chemical or solvent-based cleaners have been used.

C. LATEX ADHESIVES - Old latex adhesives must be mechanically scraped down to a bare residue. Latex adhesive residues must be smooth and level with all holes and cracks filled with a Portland cement-based patch reinforced with polymers, or encapsulated with APAC ENCapSeal.
Note: Failure to remove or seal, old latex adhesive may cause installation failure, shifting, buckling or edge curling; these conditions will not be covered under warranty.

D. CUT BACK ADHESIVES - Must be wet mechanically scraped to a minimum residue and encapsulated with APAC ENCapSeal.
Note: Failure to remove or seal old cut back adhesive may cause installation failure, shifting, buckling or edge curling; these conditions will not be covered under warranty.

E. CONCRETE MOISTURE TESTING and pH TESTING - Substrate moisture testing is not required as Kinetex Modular Flooring using required Kinetex Adhesive is rated. up to 100% RH. Alkalinity tests should be performed per ASTM F 710. The maximum acceptable pH is 12. If reading is above 12, consult with the Customer Relations Team for the best resolution. For Walk Off Capet Tiles, Substrate surfaces must be tested for moisture emission. It is the responsibility of the owner or owner's representative to perform moisture testing prior to starting the installation. ASTM-F2170-2 relative humidity probe moisture testing or ASTM-F1869 calcium chloride testing can be performed on the concrete to determine the surface moisture emission rate. Acceptable relative humidity probe testing results are up to 90% RH. An acceptable result for calcium chloride moisture testing is up to 5 lbs per 1,000 SF per 24 hours. Alkalinity tests should also be performed per ASTM-F710. The maximum acceptable pH is 9.0. Carpet prefers relative humidity probe moisture testing over calcium chloride testing, as the results are more accurate and reliable. For test results that determine RH test readings of 90%-97%, moisture emission rates of 5 lbs - 8 lbs, or pH readings of 9.0 - 11.00, Commercialon Premium Sealer is required.

SUBFLOORS

F. New Concrete - New concrete must be fully cured and free of moisture (see ASTM F 710). New concrete requires a curing period of approximately 90 days.

G. Old Concrete - Old concrete must be checked for moisture. Dry, dusty, porous floors must be primed. *Note: Primers will not correct a moisture problem. For complete information, refer to CRI-104 Installation Standard.*

H. Wood - Wood floors must be APA flooring grade smooth and level, or CanPly Select Grade. If the floor is uneven, an approved underlayment will be required. Old finishes must be tested for compatibility with adhesives or removed and porous wood primed. Wood floors must receive a roll-on application of Commercialon® Premium Sealer. Follow instructions on the

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Commercialon® Premium Sealer label.

I. Terrazzo / Marble - Level all grout lines with Portland cement-based patch reinforced with polymers. Glossy surfaces must be sanded for proper adhesive bond. Waxes and similar finishes must be removed.

J. Other Hard Surfaces (VCT/VAT) - Tiles must be well secured to the floor or removed. Broken, damaged or loose tiles must be replaced. Waxes and similar finishes must be removed from VCT before applying adhesive. Existing sheet vinyl is not a suitable substrate for modular installation and must be removed.

K. Raised Access Panel Floors - The panels must be flat, warped panels can result in the carpet modules being off grid. The panel joints must be tight and level. Screws are to be countersunk. Kinetex is not recommended for installation over Raised Access Panel Floors if the panels are frequently accessed.

L. Gypcrete - Gypcrete subfloors must be fully cured and free of high moisture (see ASTM F 2170-2). Gypcrete requires a curing period of approximately 90 days. Additionally, Gypcrete must be treated using primer in advance of applying adhesive.

M. Carpet - Remove old carpet and carpet adhesives by scraping or other mechanical means. Any remaining adhesive residues may be covered with a Portland based patching compound or encapsulated with TriSeal Sealer.

3.03 INSTALLATION OF TEXTILE COMPOSITE FLOORING

A. Install flooring in strict accordance with the finish drawings and J+J Flooring's Kinetex installation instructions.

B. ADHESIVE SYSTEM - Kinetex requires use of Kinetex Adhesive for all Kinetex flooring modules installs.

1. Full Spread Kinetex Adhesive System: Installation requires full spread use of Kinetex Adhesive. The spread rate for Kinetex Adhesive is approximately 640 square feet per four- gallon bucket over a properly prepared floor and must be spread using a 1/16" x 1/16" x 1/16" square notched trowel. Kinetex adhesive is a transitional hard-set PSA with limited working time. Allow the adhesive to dry until the anchor lines are visible and begin installation. Once the control lines are visible complete the installation within 2 hours, which includes trimming and rolling. Replace the trowel clip each time that a new 4-gallon pail of Kinetex Adhesive is opened. Kinetex adhesive average coverage is 640 SF per 4 gallon pail or 160 SF per one gallon pail.

Note: Inadequate amounts of adhesive can cause modules to shift and move and will not be covered by warranty. J+J Flooring will not be responsible for the adhesive bond where other adhesives have been used.

2. J+J Flooring requires a full spread adhesive system for installation of Nexus Modular (carpet tile). Fully spread Commercialon® Premium Modular Pressure Sensitive Adhesive using a 1/32 x 1/16 x 1/16 "U" or "V" notch trowel or spread using a 3/8" foam paint roller. Keep the roller saturated and wet with adhesive throughout the installation in order to maintain a constant spread rate. Allow to completely dry so adhesive does not transfer when touched. The spread rate for Commercialon Premium Modular Adhesive is approximately 120 sq. yds. per four gallon bucket. Nexus® Modular Spray Adhesive is available in a 14 lbs cylinder (coverage is approx. 165 sq yds). Note: Inadequate amounts of adhesive can cause modules to shift and move and will not be covered under

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warranty. Warranty coverage requires the use of Commercialon Premium Modular Adhesive. J+J Flooring will not be responsible for the adhesive bond where other adhesives have been used.

C. **MODULE PLACEMENT** - Arrows are printed on the module backing to show pile/machine direction. A tight installation without compression is mandatory for optimum performance and appearance of the modular installation. It is critical that each module uniformly touch each adjoining module without a gap. To ensure a clean tight fit, do not pull/tug or slid-in modules, but instead lay each module into its location against the adjoining module. Use your hands to press/form the module into place where the new module meets the previously installed module. **See specific product specifications for approved installation method(s).**

Note: To reposition a Kinetex module during installation, remove it by gently lifting all four sides of the module with a spatula or putty knife, rotating around each side of the module doing a little at a time. The very center of the module should be the last part of the module touching the floor upon removal. Do not stretch a module while it is in the adhesive in order to align next to an adjoin modular. An attempt to stretch will likely result in the module pulling back to its original position. NEVER ATTEMPT TO REMOVE A MODULE ALL AT ONCE BY PULLING ONE OR ONLY TWO SIDES OF THE MODULAR. DOING SO MAY LEAD TO DISTORTING THE MODULE.

D. **PALLET AND BUNDLE SEQUENCING** - It is very important to install Kinetex modules in the order they were manufactured; this is easily accomplished by selecting pallets in sequential order and following the numbers located on each bundle of modules. Typically, an installation will begin with the lowest bundle numbers and progress through the highest numbers until the project is complete. Installing modules by bundle sequence will assure the most even uniform look possible. (For layout and installation instructions refer to J+J Flooring's Kinetex Installation Instructions.)

E. **STAIRS** - Use single or double undercut stair nosing and cut modules. Then, using full spread Kinetex Adhesive or SRT Tape, install modules on steps and risers, inserting the stair nosing edge and the top of the riser edge of each module into the vinyl undercut.

F. **COMPLETING INSTALLATION** - To avoid dislodging modules, do not walk on or move furniture onto modules until the area is completely anchored. Roll entire area with 75-100 lb. roller in both directions (north-south and east-west) after completion of installation. It is also required that sheets of plywood or hardboard be laid over the new modular surface when transporting heavy furniture on carts or dollies. As a final step, vacuum the entire area with an upright vacuum.

3.04 INSTALLATION OF ACCESSORIES

A. Install accessories as required by drawings and per manufacturer's specifications.

3.05 CLEANING AND PROTECTION

A. Use a moist cloth when wet; if dry, use a solvent based product applied to a towel then worked onto the Kinetex module for removal of contaminants such as adhesive, paint, oil and grease. Follow J+J Flooring's maintenance guidelines.

B. Clean and vacuum surfaces.

END OF SECTION

SECTION 09 91 00 – PAINTING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Furnish all material, labor, scaffolding and equipment required to complete all work shown on the Drawings and specified herein.
- B. Paint all exposed surfaces except where the natural finish of the material is obviously intended and specifically noted as a surface not to be painted. Where items or surfaces are not specifically mentioned, paint these the same as adjacent similar materials or areas.
- C. Do not paint any moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, motor and fan shafts unless otherwise indicated.
- D. Do not paint any code required labels such as Underwriter's Laboratories and Factory Mutual or any equipment identification, performance rating, name or nomenclature plates.
- E. Where rooms are shown in the finish schedule to have unfinished walls and ceilings, metal doors and frames and other miscellaneous items in these spaces.

1.02 WORK SPECIFIED ELSEWHERE

- A. Unless otherwise specified, shop priming of ferrous metal items is included under the various sections for structural steel, miscellaneous metal, hollow metal work and similar items. Also for fabricated or factory built mechanical and electrical equipment or accessories.
- B. If painting of exposed piping, conduit, ductwork, insulated piping, equipment, and other mechanical or electrical work in mechanical rooms is required it shall be by the Mechanical and Electrical Contractors.
- C. Labeling of piping conduit.
- D. Concealed surfaces unless otherwise specified do not require painting. This includes walls and ceilings in inaccessible spaces such as pipe chases, furred areas, duct shafts, etc.

1.03 PRODUCT HANDLING

- A. Deliver all materials to the job site in original, new and unopened packages and containers bearing manufacturer's name and label showing at least the following:
 - 1. Name or title of the material
 - 2. Fed. Spec. number, if applicable

3. Manufacturer's stock number
 4. Manufacturer's name
 5. Contents by volume for major constituents
 6. Thinning instructions
 7. Application instructions
- B. Provide proper storage to prevent damage to, and deterioration of, paint materials.
- C. Use all means necessary to protect the materials of this section before, during, and after installation and to protect the work and materials of all other trades.
- D. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

1.04 JOB CONDITIONS

- A. Surface temperatures: Do not apply solvent-thinned paints when the temperature of surfaces to be painted and the surrounding air temperature are below 45 degrees F, unless otherwise permitted by the manufacturer's printed instructions as approved by the Architect.
- B. Weather conditions: Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85%; or to damp or wet surfaces, unless otherwise permitted by the manufacturer's printed instructions as approved by the Architect. Applications may be continued during inclement weather within the temperature limits specified by the paint manufacturer during application and drying periods.

1.05 SUBMITTALS

- A. Submit manufacturer's printed brochures showing the type of materials to be used for each painting system.

1.06 SAMPLES

- A. Before starting work, apply a sample of each color selected on at least 200 square feet of actual surface where color is to be used. Do not proceed with painting until samples are approved by Architect.

PART 2 - PRODUCTS

2.01 PAINT MATERIALS

- A. Design is based on use of paint products manufactured by Sherwin-Williams and the materials of that manufacturer are named in the Painting Schedule. Equal products of Benjamin Moore, Kelly-Moore and Pittsburgh Paints (PPG) are approved in advance by the Architect, and may be substituted for those shown.
- B. Provide the best quality grade of the various types of coatings as regularly manufactured by paint materials manufacturers approved by the Architect.

Materials not displaying the manufacturer's identification as a standard best-grade product will not be accepted.

- C. Provide paints of durable and washable quality. Do not use paint materials which will not withstand normal washing as required to remove pencil marks, ink, ordinary soil, and similar material without showing discoloration, loss of gloss, staining, or other damage.
- D. The Architect will select colors to be used in the various types of paint specified and will be the sole judge of acceptability of the various glosses obtained from the materials proposed to be used in the work.
- E. Provide undercoat paint produced by the same manufacturer as the finish coat. Use only the thinners recommended by the paint manufacturer and use only to the recommended limits. Insofar as practicable, use undercoat, finish coat, and thinner material as parts of a unified system of paint finish.
- F. Provide paint materials which meet or exceed the standards listed for each application in the Painting Schedule in Paragraph 3.5.

2.02 APPLICATION EQUIPMENT

- A. For application of the approved paint, use only such equipment as is recommended for application of the particular paint by the manufacturer of the particular paint, and as approved by the Architect.
- B. Prior to actual use of application equipment, use all means necessary to verify that the proposed equipment is actually compatible with the material to be applied and that the integrity of the finish will not be jeopardized by use of the proposed application equipment.

2.03 OTHER MATERIALS

- A. All other materials, not specifically described but required for a complete and proper installation of the work of this Section, shall be new, first-quality of their respective kinds, and as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Prior to installation of the work in this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence. Verify that painting may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the Architect.

- B. Do not proceed in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 MATERIALS PREPARATION

- A. Mix and prepare painting materials in strict accordance with the manufacturer's recommendations as approved by the Architect.
- B. Store materials not in actual use in tightly covered containers.
- C. Maintain containers used in storage, mixing, and application of paint in a clean condition, free from foreign materials and residue.
- D. Stir all materials before application to produce a mixture of uniform density, and as required during the application of materials. Do not stir into the material any film which may form on the surface. Remove the film and, if necessary, strain the material before using.

3.03 SURFACE PREPARATION

- A. General:
 - 1. Perform all preparation and cleaning procedures in strict accordance with the paint manufacturer's recommendations as approved by the Architect.
 - 2. Remove all removable items which are in place and are not scheduled to receive paint finish, or provide surface-applied protection prior to surface preparation and painting operations.
 - 3. Following completion of painting in each space or area, reinstall the removed items by using workmen skilled in the necessary trades.
 - 4. Clean each surface to be painted prior to applying paint or surface treatment.
 - 5. Remove oil and grease with clean cloths and cleaning solvents of low toxicity and a flash point in excess of 100° F prior to start of mechanical cleaning.
 - 6. Schedule the cleaning and painting so that dust and other contaminants from the cleaning process will not fall onto wet, newly painted surfaces.
- B. Preparation of wood surfaces:
 - 1. Clean all wood surfaces until they are free from dirt, oil, and all other foreign substance.
 - 2. Smooth all finished wood surfaces exposed to view, using the proper sandpaper. Where so required, use varying degrees of coarseness in sandpaper to produce a uniformly smooth and unmarred wood surface.
 - 3. Unless specifically approved by the Architect, do not proceed with painting of wood surfaces until the moisture content of the wood is 12% or less as measured by a moisture-meter approved by the Architect.
 - 4. Prime, stain, or seal wood required to be job-painted immediately upon delivery to job. Prime edges, ends, face, undersides, and backsides of such wood, including cabinets, counters, etc. When transparent finish is required, use spar varnish for backpriming.

C. Preparation of metal surfaces:

1. Thoroughly clean all surfaces until they are completely free from dirt, oil and grease.
2. On galvanized surfaces, use solvent for the initial cleaning and then treat the surface thoroughly with phosphoric acid etch. Remove all etching solution before proceeding.
3. Touch-up shop-applied prime coats wherever damaged, dirty, or bare (all steel). Wire-brush, solvent clean, and touch-up with same type shop primer.
4. Allow to dry thoroughly before application of paint.

D. Preparation of Cementitious Materials:

1. Prepare cementitious surfaces of concrete and concrete block to be painted by removing all efflorescence, chalk, dust, dirt, grease, oils, and by roughening as required to remove glaze.
2. Determine the alkalinity and moisture content of the surfaces to be painted by performing appropriate tests. If the surfaces are found to be sufficiently alkaline to cause blistering and burning of the finish paint, correct this condition before application of paint. Do not paint over surfaces where the moisture content exceeds that permitted in the manufacturer's printed directions.

3.04 PAINT APPLICATION

A. General:

1. Slightly vary the color of succeeding coats. Do not apply additional coats until the complete coat has been inspected and approved. Only the inspected and approved coats of paint will be considered in determining the number of coats applied.
2. Sand and dust between enamel coats to remove all defects visible to the unaided eye from a distance of five feet.
3. On all removable panels and all hinged panels, paint the back sides to match the exposed sides.
4. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only.
5. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint, before final installation of equipment.

B. Drying: Allow sufficient drying time between coats. Modify the period as recommended by the material manufacturer to suit adverse weather conditions.

1. Oil-base and oleo-resinous solvent-type paints shall be considered dry for recoating when the paint feels firm, does not deform or feel sticky under moderate pressure of the thumb, and the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

- C. Brush application: Brush out and work all brush coats onto the surfaces in an even film. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, and other surface imperfections will not be acceptable.
- D. Spray application: Confine spray application to metal framework and similar surfaces where hand brush work would be inferior. Wherever spray application is used, apply each coat to provide the equivalent hiding of brush-applied coats. Do not double back with spray equipment for the purpose of building up film thickness of two coats in one pass unless noted otherwise in this specification.
- E. Roller Application: Limit roller application to interior wall and ceiling finishes for second and third coats. Apply each roller coat to provide equivalent hiding as brush-applied coats.
- F. Completed work: Completed work shall match the approved samples for color, texture, and coverage. Remove, refinish, or repaint all work not in compliance with specified requirements.

3.05 PAINTING SCHEDULE

- A. General: Painting required under this section is called for on the drawings. Paint types are defined below.
- B. Exterior Paint Systems: Provide the following finish coating system for the various substrates as shown and herein specified.
 - 1. Exterior Satin Enamel: Apply to all primed or sealed exterior smooth wood surfaces.

1st Coat: S-W Exterior Latex Wood Primer # B42W8041
2nd Coat: S-W A-100 Exterior Latex Satin # A82-Series
3rd Coat: S-W A-100 Exterior Latex Satin # A82-Series
 - 2. Exterior Egg-Shell Enamel: Apply to all primed or sealed exterior metal surfaces including exterior and interior side of exterior hollow metal doors and frames.

1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer # B66-1300 Series
2nd Coat: S-W Pro Industrial Acrylic Eg-Shel # B66-1661 Series
3rd Coat: S-W Pro Industrial Acrylic Eg-Shel # B66-1661 Series
- C. Interior Paint Systems: Provide the following finish coating systems for the various substrates as shown on the Finish Schedule and herein specified.
 - 1. Paint 'A' Egg-Shell Latex Enamel: Apply to interior gypsum board where Paint 'A' is scheduled.

1st Coat: S-W ProMar® 200 Zero VOC Interior Latex Primer # B28W2600
2nd Coat: S-W ProMar® 200 Zero VOC Latex Eg-Shel # 20-2600 Series

2. Paint 'B', Flat latex wall paint: Apply to interior gypsum board and other surfaces where Paint 'B' finish is scheduled. Paint all gypsum board ceilings and furrdowns with Paint 'B'.

1st Coat: S-W ProMar® 200 Zero VOC Interior Latex Primer # B28W2600
2nd Coat: S-W ProMar® 200 Zero VOC Latex Flat # B30-2600 Series
3. Paint 'C': Water based catalyzed epoxy semi-gloss. Apply to interior gypsum board and lightweight concrete block where Paint 'C' is scheduled.

1st Coat: S-W ProMar® 200 Zero VOC Interior Latex Primer # B28W2600
(4 mils wet, 1.1 mils dry per coat)
2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss, K46-1150 Series
3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss, K46-1150 Series (4 mils wet, 1.5 mils dry per coat)
4. Paint 'D' Alkyd Resin Enamel: Apply to primed interior ferrous metal surfaces including door frames.

1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer # B66-310 Series
(5-10 mils wet, 2-4 mils dry)
2nd Coat: S-W Pro Industrial WB Alkyd Urethane Semi-Gloss, B53-1150 Series
3rd Coat: S-W Pro Industrial WB Alkyd Urethane Semi-Gloss, B53-1150 Series (4 mils wet, 1.4 mils dry per coat)
5. Paint 'E' Dry-Fog: Apply to all surfaces where Paint 'E' is scheduled.

1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer # B66-1300 Series
(5-10 mils wet, 2-4 mils dry)
2nd Coat: S-W Pro Industrial Waterborne Acylic Dryfall, B42W82
3rd Coat: S-W Pro Industrial Waterborne Acylic Dryfall, B42W82
(6 mils wet, 2 mils dry)
6. Paint 'F': Apply to all concrete floor surfaces where Paint 'F' is scheduled.

1st Coat: S-W ArmorSeal Tread-Plex Primer, B90 Series
(1.5-2 mils dry)
2nd Coat: S-W ArmorSeal Tread-Plex Finish, B90 Series
3rd Coat: S-W ArmorSeal Tread-Plex Finish, B90 Series
(3.5 mils wet, 1.5 mils dry)
7. Paint 'G' Egg-Shell Latex Enamel: Apply to interior wood where Paint 'G' is scheduled.

1st Coat: S-W Premium Wall & Wood Latex Primer # B28W8111
2nd Coat: S-W ProMar® 200 Acrylic-Alkyd Eg-Shel # B33W8251

D. Transparent Finishes:

1. Transparent Varnish Finish: Apply paste wood filler to open grained woods before finishing. Use stain to tone wood filler as required to match stained wood.
2. Alkyd Resin Varnish: Apply to interior surfaces where natural transparent finishes are required, including trim.

1st Coat: S-W Minwax Performance Series Interior Stain 7150/7151
2nd Coat: S-W Minwax Performance Series Fast-Dry Varnish 9150/9151 Series
3rd Coat: S-W Minwax Performance Series Fast-Dry Varnish 9150/9151 Series
3. Exterior Transparent Stain: Apply to exterior wood soffits, glu-lams and trim.
1st Coat: PPG Proluxe SRD, transparent or semi-transparent finish.

F. Finish Locations:

1. Paint systems to be used in various locations are generally shown on the Finish Schedule.
2. In rooms where the schedule does not call for a finish, paint metal door frames, metal doors, and other items applied to, or installed in, the walls.

END OF SECTION

SECTION 10 14 23
INTERIOR PANEL SIGNAGE

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. All primary and secondary directories, directionals, room identification, workstation ID's and signage for ADA and life safety code compliance.
- B. Related Sections:
 - 1. Division 1: Administrative, procedural and temporary work requirements.

1.2 REFERENCES

- A. Signs and their installation shall comply with applicable provisions of the latest edition of the following standards and with requirements of authorities having jurisdiction:
 - 1. ADAAG – Americans with Disabilities Act Accessibility Guidelines; US Architectural and Transportation Barriers Compliance Board.
 - 2. International Code Council/American National Standards Institute A117.1- Standard on Accessible and Usable Buildings Facilities.
 - 3. National Fire Protection Association 101 Life Safety Code.

1.3 SUBMITTALS

- A. Submittals for Review:
 - 1. Sign finishes, location plan and copy shall be submitted within an interactive web-based database allowing digital review and approval within the context of the floor plans.
 - 2. Approval drawings showing materials, construction detail, lay-out, copy, size and mounting methods.
 - 3. Engineering drawings for each sign type.
 - 4. Sample of two sign types for verification of materials, color, pattern, overall quality, and for adherence to drawings and requirements indicated.

1.4 QUALIFICATIONS

- A. Manufacturer specializing in manufacturing the products specified in this section shall have a minimum of five years' experience. All products must meet characteristics specified below when quoting an alternate. Alternates should be closely similar to the dimensions, color, pattern, function and quality. Alternate offerings shall provide samples of (2) sign types to architect and/or owner. Failure to identify the products quoted as the requested brand name or "equal" products shall be considered non-responsive. All signs shall be obtained from one source and a single manufacturer.

1.5 WARRANTY

- A. Provide manufacturer's warranty against defects in materials and workmanship for minimum 5 years.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Signage shall be Vivid as manufactured by Takeform, 1.800.528.1398, www.takeform.net or Architect approved equal.
- B. Substitutions: Bidder must obtain prior written approval from the Architect and/or Owner to bid alternates or substitutions to the specification.

2.2 SIGN STANDARDS

- A. It is the intent of these specifications to establish a sign standard for the Owner including but not limited to primary and secondary directories, wall mounted and overhead directionals, flag mounted directionals, primary room identification, restrooms, conference room, work station ID's and all code compliant signage. While the Owner may not obtain all signs and sign types, the signage contractor shall design and submit approval drawings for all.
- B. Engineered and Tested:
The signage system shall have undergone rigorous testing to ensure longevity and optimal performance. Testing shall include environmental testing to ensure that materials can withstand changes in temperature and humidity without distortion as well as testing to ensure resistance to chemicals and UV effects. Further, mechanical testing shall ensure that the tensile and pull-out strength of mounting hardware is adequate to ensure a safe installation. Test data shall be included with submittals.
- C. Typography:
 - 1. Type style: ADA Futura . Copy shall be a true, clean, accurate reproduction of typeface(s) specified. Upper and lower case or all caps shall be as indicated in Sign Type drawings and Signage Schedule. Letter spacing to be normal and interline spacing shall be set by manufacturer.
 - 2. Grade II Braille utilizing perfectly round, clear insertion beads.
- D. Evacuation Maps:
 - 1. Evacuation maps shall have a unique "you are here" orientation.
- E. Color and Finishes:
 - 1. Colors, patterns and artwork:
Face Material – Sky the Limit
Raised Text – Black
Insert Background – Sea Smoke
Insert Text – Dimout
Metal Accents - Black
 - 2. Finishes are to meet current federal ADA and all state and local requirements.

2.3 SIGNS

- A. Signage System:
 - 1. The signage shall be a direct print acrylic sign system with applied graphics including all tactile requirements in adherence to ADA specifications.
 - 2. Signage shall be capable of accepting direct prints including colors, patterns, graphic images and photography. Prints shall be second surface to protect from scratches, fading or other damage.
 - 3. All signs, including work station and room ID's, overheads and flag mounts, directionals and directories shall have a matching appearance and constructed utilizing the same manufacturing process to ensure a consistent look throughout.
- B. Materials:
 - 1. Signage shall be fabricated of acrylic, .375" thick, comprised of two layers. Edges shall be smooth without chips, burrs, sharp edges or marks. The direct print shall be second surface to prevent scratching, fading or other damage.
 - 2. Acrylic shall be non-glare optically clear with a P99 finish assuring no loss of clarity or composition of the print.
 - 3. Insert components shall have a .080 non-glare acrylic window and shall be inlaid flush to sign face for a smooth, seamless appearance.
 - 4. Tactile lettering shall be precision machined, raised 1/32", matte PETG and subsurface colored for scratch resistance.
 - 5. The signage shall utilize an acrylic sphere for Grade II Braille inserted directly into a scratch resistant, acrylic face. Braille dots are to be pressure fit in high tolerance drilled holes. Braille dots shall be half hemispherical domed and protruding a minimum 0.025".
 - 6. The signage shall utilize a pressure activated adhesive. The adhesive shall be nonhazardous and shall allow for flexing and deflection of the adhered components due to changes in temperature and humidity without bond failure.
 - 7. Signage shall have an acrylic shim plate. The shim shall lift the sign off the wall to facilitate cleaning and painting without sign removal.
 - 8. All signs shall be provided with appropriate mounting hardware. All hardware shall have a polished anodized finish, architectural in appearance and suitable for the mounting surface.
 - 9. Some signs may be installed on glass. A blank backer is required to be placed on the opposite side of the glass to cover tape and adhesive. The backer shall match the sign in size and shape.
- C. Colors, Patterns, Imagery and Artwork:
 - 1. Vendor shall provide an online library of images including patterns, graphics and photography. The library shall be organized by idea or theme to facilitate the selection of images appropriate for the project.
 - 2. All images shall have a minimum resolution of 300 dpi.
 - 3. Face and background colors shall be per the drawings.
 - 4. Standard tactile colors shall match manufacturer's ADA standard color selection. Font and font colors shall be per the drawings.
- D. Printed Inserts
 - 1. The signage shall accommodate polyester inserts (for opaque), polycarbonate inserts (for clear), or printed paper inserts by Owner to allow updating as required.
 - 2. The signage contractor shall provide and install all signage inserts.

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3. Manufacturer shall provide a template containing layout, font, color, artwork and trim lines to allow Owner to produce inserts on laser or ink jet printer. The template shall be in an Acrobat or Word format (.pdf).

- E. Quantities:
Code and Facility Signage:

Sign Type D	Evacuation Map	(4)
Sign Type E.2	Restroom	(4)
Sign Type G.2	Large Room ID	(7)
Sign Type H	Room ID Changeable Insert	(5)

PART 3 EXECUTION

3.1 SITE VISITS

- A. Site visits – 3 site visits shall be required by the sign contractor:
1. Prior to submission of bid for site assessment and evaluation.
 2. Post award for the purposes of meeting with Owners and project manager.
 3. Final walk-through and punchlist.
- B. Programming – sign contractor shall perform all wayfinding & programming. Programming shall include location plan, message schedule, and/or plots, fire/evacuation maps and insert graphics. All programming materials shall be submitted for approval.

3.2 CODE COMPLIANCE

- A. It shall be the responsibility of the successful bidder to meet any and all local, state, and federal code requirements in fabricating and installing signs.

3.3 DELIVERY, STORAGE, PROTECTION

- A. Package to prevent damage or deterioration during shipment, handling, storage and installation. Products should remain in original packaging until removal is necessary. Store products in a dry, indoor location.

3.4 EXAMINATION

- A. Installer shall examine signs for defects, damage and compliance with specifications. Installation shall not proceed until unsatisfactory conditions are corrected.

3.5 INSTALLATION

- A. General: Installation locations shall be in accordance with ADA specifications. Locate signs where indicated using mounting methods in compliance with manufacturer's written instructions:
1. The signage contractor shall coordinate installation schedules with the Owner and/or Construction Manager.

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2. Installation shall be performed by manufacturer's personnel trained and certified in manufacturer's methods and procedures.
3. The signage contractor shall submit a CAD generated location plan noting the location of all signage and cross referenced to message schedule or plots for architect's approval.
4. Installer to conduct a pre-installation survey prior to manufacturing to verify copy and sign location. Each location shall be noted using a low tack vinyl reproduction of actual sign. Full scale renderings of directories and directionals shall also be provided. Any location discrepancy or message issues shall be submitted to architect for review.
5. Signs shall be level, plumb, and at heights indicated with sign surfaces free from defects.
6. Upon completion of the work, signage contractor shall remove unused or discarded materials, containers and debris from site.

3.6 DIGITAL SIGN MANAGER

- A. Manufacturer shall provide a cloud-based, password protected sign management platform enabling the Owner to view and manage their sign assets. Every sign, sign type, mounting surface, copy, graphic treatment and building location shall be viewable and accessible through the platform. The online sign management tool shall facilitate sign changes and additions seamlessly updating the system to reflect current conditions.

END OF SECTION

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SECTION 10 28 00 - TOILET AND BATH ACCESSORIES

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.

1.02 SUMMARY

- A. This Section includes toilet accessory items as scheduled or specified below.

1.03 RELATED SECTIONS

Section 06 01 00 - Rough Carpentry

1.04 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specifications Sections.
- B. Product data for each toilet accessory item specified, including construction details relative to materials, dimensions, gages, profiles, mounting method, specified options, and finishes.
- C. Schedule indicating types, quantities, sizes, and installation locations (by room) for each toilet accessory item to be provided for project.

1.05 QUALITY ASSURANCE

- A. Inserts and Anchorages: Furnish accessory manufacturers' standard inserts and anchoring devices that must be set in concrete or built into masonry. Coordinate delivery with other work to avoid delay.

1.06 PROJECT CONDITIONS

- A. Coordination: Coordinate accessory locations, installation, and sequencing with other work to avoid interference with and ensure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

PART 2 - PRODUCTS

2.01 ACCESSORIES

- A. Grab Bars - Stainless Steel Type: Provide grab bars with wall thickness not less than 0.05" and as follows:

1. Mounting: Concealed, manufacturer's standard flanges and anchorages.
 2. Clearance: 1-1/2" clearance between wall surface and inside face of bar.
 3. Gripping Surfaces: Smooth, satin finish.
 4. Heavy-Duty Size: Outside diameter of 1-1/2".
 5. Grab bars shall be 42", 36", and/or 18" long as shown on Drawings.
- B. Mirror: Bobrick 165 Series Mirror with stainless steel angled frame. Size to be as shown on Drawings, or equal.
- C. Paper Towel & Dispenser: By Owner
- D. Soap Dispenser: By Owner.
- E. Toilet Tissue Dispenser: By Owner.
- F. Mop Rack: Bobrick, 223 36.
- G. Shower Curtain Rod: Bobrick B-6107.
- H. Coat Hook: Bobrick, 212. To be located in each restroom with a shower.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install toilet accessory units according to manufacturers' instructions, using fasteners appropriate to substrate as recommended by unit manufacturer. Install units plumb and level, firmly anchored in locations and at heights indicated.
- B. Install grab bars to withstand a downward load of at least 250 lbf, complying with ASTM F 446.

3.02 ADJUSTING AND CLEANING

- A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.
- B. Clean and polish all exposed surfaces strictly according to manufacturer's recommendations after removing temporary labels and protective coatings.

END OF SECTION

SECTION 10 44 00 - FIRE EXTINGUISHERS, CABINETS, AND 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 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for cabinets include rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.

1.03 QUALITY ASSURANCE

- A. Coordination: Verify that cabinets are sized to accommodate type and capacity of extinguishers indicated and provided by Owner under separate Contract.
- B. UL-Listed Products: Fire extinguishers shall be UL listed with UL listing mark for type, rating, and classification of extinguisher.
- C. Extinguishers shall be designed to address Class A, B, and C fires in general public areas. In Kitchen areas, extinguishers shall be designed to address a Class K fire.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Fire Extinguisher Cabinets: Where shown on Drawings, install J.L. Industries Ambassador 1017V10 w/ LDCVWRFE fire extinguisher cabinet, or equal. Provide one Cosmic 5E Fire Extinguisher inside each cabinet.
- B. Fire Rated Fire Extinguisher Cabinets: Where cabinet occurs in a fire rated wall, provide Cosmopolitan 1037F10 FX fire rated cabinet as manufactured by J.L. Industries.
- C. Fire Extinguisher Cabinets: Where shown on Drawings in Kitchen areas, install UL Industries 2037 F10 fire extinguisher cabinet, or equal. Provide one Saturn 15 fire extinguisher inside each cabinet.

- D. Fire extinguisher, not shown to be located in cabinets, shall be provided with wall mounting brackets. Similar to Larsen's Manufacturing Company B-2 wall bracket.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Fire extinguishes shall be mounted with the handles mounted not more than 48" above finish floor.
- B. Install in locations and at mounting heights indicated or, if not indicated, at heights to comply with applicable regulations of governing authorities.

END OF SECTION

SPECIFICATIONS

Section 107301 – Cantilevered Walkway Cover

Part 1: General

1.1 Related Documents

- A. The requirements of Division 1 specifications shall apply to work specified in the section.

1.2 Engineering Design Criteria

- A. International Building Code 2018
- B. ASCE 7-16, Minimum Design Loads for Buildings and Other Structures
- C. Aluminum Design Manual 2015
- D. AWS D1.2 – 2014, Structural Welding Code - Aluminum
- E. Local governing codes and standards for site location

1.3 General Description of Work

- A. Work in this section shall include design, fabrication, and installation of aluminum protective covers. All work shall be in accordance with the shop drawings and this specification section.

1.4 Submittals

- A. Shop Drawings – Submit complete shop drawings including:
 - 1) Overall canopy layout dimensions
 - 2) Cut section details including elevation, bent layout dimensions, canopy connection details, and wall connection details
 - 3) Flashing details pertaining to aluminum canopy
 - 4) Canopy anchorage details
- B. Product Data – Submit manufacturer's product information, specifications, and installation instructions for the aluminum canopy.
- C. Samples – Submit color selection samples of actual coated aluminum material or actual anodized aluminum material.
- D. Certification – Provide Professional Engineer certification that the proposed canopy design and layout meets or exceeds all applicable loadings (ex: wind load, rain live load, dead load, snow load) for the job location (city & state) in accordance with IBC 2015 and ASCE 7-16.

- 1) The Subcontractor shall be responsible for ensuring that all aluminum canopy structures are designed to withstand snow drift loads in full compliance with the current International Building Code (IBC) and ASCE 7 standards.
- 2) Structural calculations accounting for site-specific snow drift loads—including drift height, width, surcharge loads, and other contributing factors—must be included as part of the submittal package. These calculations shall be prepared and sealed by a Professional Engineer (PE) licensed in the state where the project is located.
- 3) No fabrication or installation shall commence prior to written approval of the stamped calculations by the Architect/Engineer of Record.
- 4) Compliance with this requirement is mandatory. Failure to include snow drift considerations will be grounds for rejection of submittals or installed work, and any required revisions shall be at the Subcontractor's expense.

1.5 Quality Assurance

- A. Manufacturer Qualifications: Minimum five years of experience in design, fabrication, and production of aluminum protective covers.
- B. Components shall be assembled in shop to greatest extent possible to minimize field assembly.
- C. Aluminum protective cover, including material and workmanship, shall be warranted from defects for a period of one year from date of completion of aluminum protective cover installation.

Part 2: Products and Materials

2.1 Acceptable Manufacturers

A. Mitchell Metals, LLC

1761 McCoba Drive
Smyrna, GA 30080
Phone: 770.431.7300
www.mitchellmetals.net

B. Dittmer Architectural Aluminum

1006 Shepard Road
Winter Springs, FL 32708
Phone: 407.699.1755
www.dittdeck.com

- C. Equivalent systems by other manufacturers will be approved for substitution by addendum if the following conditions are met:
- 1) Other manufacturers must have submitted requested information and

- have been qualified to bid no less than 15 days prior to bid closing date.
- 2) Manufacturer must submit complete company literature and information to the architect for review
 - 3) Manufacturer must submit complete proposed canopy system details, including sizes and strength values of all members to be used.

2.2 Design & Assembly

- A. Aluminum protective cover shall consist of cantilevered bents comprised of column with fully welded angle brace and a horizontal drain beam mechanically fastened down to the column and brace. Cantilever bent construction shall result in a 2-degree pitch of the canopy toward the draining side.
- B. Canopy shall use perimeter extruded gutter and extruded decking running parallel to length of sidewalk. Beams are to be full welded at both ends to eliminate leaking of water. Beams are to be notched to receive the extruded gutter to allow decking to sit flush to the top of the beam. Extruded decking shall be a roll-locked design where the extruded cap strips and pans shall interlock to make a rigid structure. Crimped decking is not allowed. Pans are to be welded at ends to prevent water leakage. Standard T-flashing shall be used where decking is separated at a drain beam. The false fascia is to be secured using a rivet every 4'-0" on center connecting the fascia to the edge pans. Tie back straps are to be installed connecting the top of the fascia to the decking at 8'-0" on center.
- C. Canopies shall drain from the decking into the drain beam and discharge via scupper mounted to bottom of beam.
- D. Columns are to be locked into the concrete foundation using a single piece of rebar, approximately 9" long, running through the bottom of the column below finished floor.

2.3 Materials

- A. Columns
 - 1) Columns are to be radius cornered aluminum tubular extrusion. Size of column used shall exceed loading requirements in section 1.2 – Engineering Design Criteria of size indicated on architect's drawings. Minimum column size shall be 6"x 12" at 0.188" thick.
 - 2) Provide clear acrylic protection or bituminous paint protection between the aluminum column and the concrete footer.
 - 3) Drainage through columns will not be allowed.
- B. Beams
 - 1) Beams are to be open topped aluminum tubular extrusions.
 - 2) Size of beam used shall exceed loading requirements in section 1.2 – Engineering Design Criteria. Minimum beam size shall be 6"x 12" at

0.188" thick.

C. Decking

- 1) Decking shall be a rigid roll-locked design that is self flashing and utilizes interlocking sections.
- 2) Extruded decking shall exceed loading requirements in section 1.2 – Engineering Design Criteria. Minimum 3" x 6" flat pan at 0.080 thick.
- 3) Where decking is run parallel to walkway, the ends of the pans shall be welded closed where decking does not terminate into a drain beam.

D. Gutter

- 1) Gutter shall be radius cornered aluminum extrusion that exceeds loading requirements in section 1.2 – Engineering Design Criteria. Minimum gutter size shall be 4"x 6" at 0.093" thick.

E. Flashing

- 1) Flashing shall be made of aluminum sheet painted to match the color of the canopy. Minimum flashing thickness shall be 0.040" thick.

2.4 Fasteners

- A. All framing fasteners shall be 300 series stainless steel with neoprene washers. All rivets are 3/16" aluminum. All decking fasteners shall be long life coated steel with a 300 series stainless steel cap and neoprene washer.

2.5 Finishes

A. Fluoropolymer Finish (Kynar 500®/Hylar 5000®):

- 1) Factor -applied coating meeting AAMA 2605 ("Superior Performance Organic Coatings on Aluminum Extrusions and Panels"), minimum 70 % PVDF resin content.
- 2) Coating shall be applied by a certified applicator with documented quality-control procedures and coating manufacturer certification.
- 3) Field application or in-house application by the canopy manufacturer shall not be permitted.

- B. Powder coating aluminum, field-applied coatings, and finishes not meeting the above criteria will not be accepted.

Part 3: Installation and Execution

3.1 Erection

- A. Canopies are to be installed according to approved shop drawings and plans.
- B. The entire structure shall be installed straight, true, and plumb according to standard construction procedures.
- C. Canopies shall be installed minimal slope to allow water flow from top of canopy to

draining scupper and eliminate ponding.

- D. Non-draining columns shall have weep holes drilled through column at top of finished concrete to remove condensation from post. Minimum weep hole size shall be 1/4" in diameter.
- E. All joints, corners, and connections shall be tight and clean.
- F. All exposed fasteners are to be painted to match the canopy color.
- G. Decking is to be aligned and secured to aluminum frame structure.

3.2 Column Foundations

- A. Styrofoam blockouts shall be provided by the canopy manufacturer and installed by the General Contractor into the concrete foundation.
- B. General Contractor shall pour the required concrete foundation size around the Styrofoam blockouts provided by the manufacturer.
- C. Canopy installer is to remove the Styrofoam after the foundation has cured, set column in cavity, and fill with minimum 2000 psi grout to level of finished concrete slab.
- D. Slab mounting of aluminum columns for cantilevered canopies is not allowed.
- E. Foundation/Footing design and installation is not covered in this specification and scope of work.

3.3 Cleaning

- A. All canopy surfaces exposed are to be cleaned after installation is complete.
- B. Surplus materials and debris shall be removed from the jobsite after installation is complete.

3.4 Protection

- A. General Contractor shall ensure protection of installed aluminum canopies from other construction so that canopies are without damage at time of substantial completion of project.

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SECTION 12 24 00 - ROLLER SHADES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Manually operated, roll-up fabric interior window shades including mounting and operating hardware to be installed on exterior windows.

1.02 RELATED SECTIONS

- A. Section 06 01 00 - Rough Carpentry
- B. Section 09 21 16 - Gypsum Board Assemblies
- C. Section 09 51 13 - Acoustical Panel Ceilings

1.03 REFERENCES

- A. NFPA 701-99 - Fire Tests for Flame-Resistant Textiles and Films.
- B. GREENGUARD Environmental Institute Gold.

1.04 SUBMITTALS

- A. Submit under provisions of Section 01 33 00 - Submittals:
- B. Product Data: Manufacturer's data sheets on each product specified, including:
 - 1. Preparation instructions and recommendations.
 - 2. Installation and maintenance instructions.
 - 3. Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.
 - 4. Storage and handling requirements and recommendations.
 - 5. Mounting details and installation methods.
- C. Shop Drawings: Plans, elevations, sections, product details, installation details, operational clearances, and relationship to adjacent work.
- D. Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Drawings, field verified window dimensions, quantities, type of shade, controls, fabric, and color, and include opening sizes and key to typical mounting details.
- E. Selection Samples: For each finish product specified, two complete sets of shade cloth options and aluminum finish color samples representing manufacturer's full range of available colors and patterns.
- F. Verification Samples: For each finish product specified, two complete sets of shade components, unassembled, demonstrating compliance with specified requirements. Shade fabric sample and aluminum finish sample as selected, representing actual product, color, and patterns. Mark face of material to indicate interior faces.

- G. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware.
- H. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Obtain roller shades through one source from a single manufacturer with a minimum of twenty years' experience in manufacturing products comparable to those specified in this section.
- B. NFPA Flame-Test: Passes NFPA 701. Materials tested shall be identical to products proposed for use.
- C. Mock-Up: Provide a mock-up of one of each type roller shade assembly specified for evaluation of mounting, appearance and accessories.
 - 1. Locate mock-up in window(s) designated by Architect.
 - 2. Do not proceed with remaining work until mock-up is accepted by Architect.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver window shades until building is enclosed and construction within spaces where shades will be installed is substantially complete.
- B. Deliver products in manufacturer's original, unopened, undamaged containers with labels intact.
- C. Label containers and shades according to Window Shade Schedule.
- D. Store products in manufacturer's unopened packaging until ready for installation.

1.07 SEQUENCING

- A. Ensure that locating templates and other information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress.
- B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.08 PROJECT CONDITIONS

- A. Install roller shades after finish work and ambient temperature, humidity and ventilation conditions are maintained at levels recommended for project upon completion.

1.09 WARRANTY

- A. Hardware and Shade Fabric: Draper's standard twenty-five year limited warranty.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design Manufacturer: Draper, Inc., 411 S. Pearl PO Box 425; Spiceland, IN 47385-0425. ASD. Toll Free Tel: 800-238-7999; Tel: 765-987-7999; Fax: 866-637-5611; Web:www.draperinc.com., or equal.
- B. Manually Operated Window Shades with Independent Control: Manually operated, vertical roll-up, fabric window shade with components necessary for complete installation; Manual FlexShade as manufactured by Draper, Inc.
 - 1. Operation: Bead chain and clutch operating mechanism allowing shade to stop when chain is released. Designed never to need adjustment or lubrication. Provide limit stops to prevent shade from being raised or lowered too far.
 - a. Clutch mechanism: Fabricated from high carbon steel and molded fiberglass reinforced polyester or injected molded nylon. White or Black color as selected by Architect.
 - b. Bead chain loop: Stainless steel bead chain hanging at side of window.
 - c. Idler Assembly: Provide roller idler assembly of molded nylon with adjustable or spring-loaded length idler pin to facilitate easy installation, and removal of shade for service.
 - d. Bead Chain Hold Down: P-Clip (standard).
 - 2. Roller Tube: Fabricated from extruded aluminum, galvanized steel, or enameled steel. Diameter, wall thickness, and material selected by manufacturer to accommodate shade type and size. Fabric connected to the roller tube with LSE (low surface energy) double sided adhesive specifically developed to attach coated textiles to metal. Adhesive attachment to eliminate horizontal impressions in fabric.
 - 3. Bottom Slat:
 - a. Open pocket elliptical slat: 1" (25mm) aluminum elliptical slat with plastic ends inside of a 1 5/8" (41mm) pocket.
 - 4. Mounting:
 - a. Mounting brackets.
 - a. Endcaps and fascia.
 - 5. Brackets: Plated stamped steel. Provide size compatible with roller size.
 - a. Mounted to storefront system.

6. Endcaps: Stamped steel with universal design suitable for mounting to ceiling, wall, and jamb. Provide size compatible with roller size.
 - a. Endcap covers: To match fascia or headbox color.
7. Fascia: L shaped aluminum extrusion to conceal shade roller and hardware.
 - a. Attachment: Snaps onto endcaps without requiring exposed fasteners of any kind. Fascia can be mounted continuously across two or more shade bands. No notching is required.
 - b. Shape: Square Fascia Panel.
 - c. Finish: standard color as selected by the Architect.

2.02 FABRIC

A. Light-Filtering Fabrics

1. SheerWeave Series SW2400 by Phifer: VOC Emissions: GREENGUARD Gold - certified as a low emitting fabric. Manufacturer to supply GREENGUARD Gold. 500 denier fiberglass, vinyl coated and woven into a 2 x 2 basket weave. Fire rating: NFPA 701. Bacteria and Fungal Resistance: ASTM G 21 and ASTM G 22. Series SW2400, 3 percent open, .019 inches thick.

- B. Color and pattern: As selected by Architect from manufacturer's standard range.

2.03 SHADE LOCATIONS

- A. VESTIBULE 101
- B. CONFERENCE 103
- C. OFFICE 104
- D. OFFICE 105
- E. OFFICE 111
- F. OFFICE 109
- G. BREAK ROOM 108

PART 3 - EXECUTION

3.01 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.

3.02 PREPARATION

- A. Coordinate requirements for blocking and structural supports to ensure adequate means for installation of window shades.

- B. Coordinate requirements for blocking, construction of shade pockets, and structural supports to ensure adequate means for installation of window shades.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install roller shades level, plumb, square, and true. Allow proper clearances for window operation hardware.
- C. Install the following items to conceal roller and operating mechanism. Do not use exposed fasteners.
 - 1. Fascias.
 - 2. Closure panels.
 - 3. Endcaps.
- D. Position shades level, plumb, and at proper height relative to adjacent construction. Secure with fasteners recommended by manufacturer.

3.04 TESTING AND DEMONSTRATION

- A. Test window shades to verify that interface to other building systems and other operating components are functional. Correct deficiencies.
- B. Test window shades to verify that operating mechanism, fabric retainer, and other operating components are functional. Correct deficiencies.
- C. Demonstrate operation of shades to Owner's designated representatives.

3.05 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

3.06 SCHEDULES

- A. Refer to Drawings for shade types and locations.

END OF SECTION

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SECTION 22 0517
SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe sleeves.

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.

1.03 REFERENCE STANDARDS

- A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2024.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.
- B. Provide temporary protective coating on cast iron and steel sleeves if shipped loose.

1.05 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

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.
 - 3. Blocked Out Floor Openings: Provide 1-1/2 inch (40 mm) angle set in silicon adhesive around opening.
 - 4. Drilled Penetrations: Provide 1-1/2 inch (40 mm) angle ring or square set in silicone adhesive around penetration.
- B. Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.
- C. 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.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.

3.02 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. 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.
 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 mm).
 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- E. Structural Considerations: Do not penetrate building structural members unless indicated.
- F. Provide sleeves when penetrating floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
 2. Aboveground Piping:
 - a. Pack solid using mineral fiber complying with ASTM C592.
 - b. Fill space with an elastomer caulk to a depth of 0.50 inch (15 mm) where penetrations occur between conditioned and unconditioned spaces.
 3. All Rated Openings: Caulk tight with fire stopping material complying with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.
 4. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.
- G. 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.

3.03 CLEANING

- A. Upon completion of work, clean all parts of the installation.
- B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION

SECTION 22 0523
GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Angle valves.
- B. Ball valves.
- C. Check valves.

1.02 ABBREVIATIONS AND ACRONYMS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Non-rising stem.
- E. OS&Y: Outside screw and yoke.
- F. PTFE: Polytetrafluoroethylene.
- G. RS: Rising stem.
- H. TFE: Tetrafluoroethylene.
- I. WOG: Water, oil, and gas.

1.03 REFERENCE STANDARDS

- A. ASME B1.20.1 - Pipe Threads, General Purpose, Inch; 2013 (Reaffirmed 2018).
- B. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard; 2025.
- C. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves; 2022, with Errata (2023).
- D. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
- E. ASME B16.34 - Valves — Flanged, Threaded, and Welding End; 2025.
- F. ASME B31.9 - Building Services Piping; 2025.
- G. MSS SP-45 - Drain and Bypass Connections; 2020.
- H. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves; 2019.
- I. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .
- J. NSF 61 - Drinking Water System Components - Health Effects; 2025, with Addendum
- K. NSF 372 - Drinking Water System Components - Lead Content; 2024.

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.
- C. Maintenance Materials: Furnish Owner with one wrench for every five plug valves, in each size of square plug valve head.
 - 1. See Section 01 6000 - Product Requirements for additional provisions.

1.05 QUALITY ASSURANCE

- A. Manufacturer:
 - 1. Obtain valves for each valve type from single manufacturer.
 - 2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Minimize exposure of operable surfaces by setting plug and ball valves to open position.
 - 2. Protect valve parts exposed to piped medium against rust and corrosion.
 - 3. Protect valve piping connections such as grooves, weld ends, threads, and flange faces.
 - 4. Secure check valves in either the closed position or open position.
- 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 in dry environment.
 - b. Store valves off the ground in watertight enclosures when indoor storage is not an option.

PART 2 PRODUCTS

2.01 APPLICATIONS

- A. See drawings for specific valve locations.
- B. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).
- C. Provide the following valves for the applications if not indicated on drawings:
 - 1. Shutoff: Ball, butterfly, gate or plug.
 - 2. Swing Check (Pump Outlet):
 - a. 2 inch (50 mm, DN) and Smaller: Bronze swing check valves with bronze disc.
- D. Required Valve End Connections for Non-Wafer Types:
 - 1. Steel Pipe:
 - a. 2 inch (50 mm, DN) and Smaller: Threaded ends.
 - 2. Copper Tube:
 - a. 2 inch (50 mm, DN) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
- E. Low Pressure, Compressed Air Valves 150 psi (1035 kPa) or Less:
 - 1. 2 inch (50 mm, DN) and Smaller:
 - a. Bronze: Provide with threaded ends.
 - b. Ball: Two piece, full port, bronze with bronze trim.
- F. Domestic, Hot and Cold Water Valves:
 - 1. 2 inch (50 mm, DN) and Smaller:
 - a. Bronze: Provide with threaded ends.
 - b. Bronze Angle: Class 125, bronze disc.
 - c. Ball: Two piece, full port, bronze with bronze trim.
 - d. Bronze Swing Check: Class 125, bronze disc.

2.02 GENERAL REQUIREMENTS

- A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
- B. Valve Sizes: Match upstream piping unless otherwise indicated.
- C. Valve Actuator Types:
 - 1. Handwheel: Valves other than quarter-turn types.
 - 2. Hand Lever: Quarter-turn valves 6 inch (150 mm, DN) and smaller except plug valves.
 - 3. Wrench: Plug valves with square heads.
- D. Insulated Piping Valves: With 2 inch (50 mm, DN) stem extensions and the following features:
 - 1. Gate Valves: Rising stem.

2. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
- E. Valve-End Connections:
 1. Threaded End Valves: ASME B1.20.1.
 2. Pipe Flanges and Flanged Fittings 1/2 inch (15 mm, DN) through 24 inch (600 mm, DN): ASME B16.5.
 3. Solder Joint Connections: ASME B16.18.
- F. General ASME Compliance:
 1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
 2. Solder-joint Connections: ASME B16.18.
 3. Building Services Piping Valves: ASME B31.9.
- G. Potable Water Use:
 1. Certified: Approved for use in compliance with NSF 61 and NSF 372.
 2. Lead-Free Certified: Wetted surface material includes less than 0.25 percent lead content.
- H. Valve Bypass and Drain Connections: MSS SP-45.
- I. Source Limitations: Obtain each valve type from a single manufacturer.

2.03 BRONZE, ANGLE VALVES

- A. Class 125; CWP Rating: 200 psi (1380 kPa):
 1. Comply with MSS SP-80, Type 1.
 2. Body: Bronze; ASTM B62, with integral seat and screw in bonnet.
 3. End Connections: Pipe thread.
 4. Stem: Bronze.
 5. Disc: Bronze.
 6. Packing: Asbestos free.
 7. Handwheel: Bronze or aluminum.

2.04 BRONZE, BALL VALVES

- A. General:
 1. Fabricate from dezincification resistant material.
 2. Copper alloys containing more than 15 percent zinc are not permitted.
- B. Two Piece, Full Port with Bronze Trim:
 1. Comply with MSS SP-110.
 2. WSP Rating: 150 psi (1035 kPa).
 3. WOG Rating: 400 psi (2758 kPa).
 4. Body: Forged bronze.
 5. Ends Connections: Pipe thread or solder.
 6. Seats: PTFE.
 7. Stem: Bronze, blowout proof.
 8. Ball: Chrome plated brass.
 9. Operator: Provide lockable handle and stem extension.

2.05 BRONZE, SWING CHECK VALVES

- A. General:
 1. Fabricate from dezincification resistant material.
 2. Copper alloys containing more than 15 percent zinc are not permitted.
- B. Class 125:
 1. Pressure and Temperature Rating: MSS SP-80, Type 3.
 2. Design: Y-pattern, horizontal or vertical flow.
 3. WOG Rating: 200 psi (1380 kPa).

4. Body: Bronze.
5. End Connections: Threaded.
6. Disc: Bronze.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.
- B. Verify valve parts to be fully operational in all positions from closed to fully open.
- C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.
- D. Should valve is determined to be defective, replace with new valve.

3.02 INSTALLATION

- A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
- B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

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 supports, guides, shields, and saddles.
- F. Anchors and fasteners.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 05 5000 - Metal Fabrications.

1.03 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).
- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- 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; 2025.
- D. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2024.
- E. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.
- G. 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; 2025.
- H. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
- I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.
- J. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- K. FM (AG) - FM Approval Guide; Current Edition.
- L. MFMA-4 - Metal Framing Standards Publication; 2004.
- M. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.
- N. UL (DIR) - Online Certifications Directory; Current Edition.
- O. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components 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. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 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.

1.05 QUALITY ASSURANCE

- A. Comply with applicable building code.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

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. 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.
- D. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
- E. 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.
- F. Corrosion Resistance: Use corrosion-resistant metal-based materials fully compatible with exposed piping materials and suitable for the environment where installed.
 - 1. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
 - 2. Outdoor, Damp, or Wet-Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.

2.02 PREFABRICATED TRAPEZE-FRAMED SYSTEMS

- A. Prefabricated Trapeze-Framed Metal Strut Systems:
 - 1. Manufacturers:
 - a. Gripple, Inc: www.gripple.com/#sle.
 - b. Unistrut, a brand of Atkore International, Inc: www.unistrut.com/#sle.
 - c. Or equal.
 - d. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.
 - 2. MFMA-4 compliant, pre-fabricated, MSS SP-58 Type 59 continuous-slot metal strut channel with associated tracks, fittings, and related accessories.

3. MFMA-4 compliant, prefabricated, side-loading continuous-slot metal strut channel bracket with associated tracks, fittings, and related accessories.
4. 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.
5. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch (2.66 mm).
6. Minimum Channel Dimensions: 1-5/8 inch (41 mm) width by 13/16 inch (21 mm) height.
7. 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. Manufacturers:
 - a. ABB Installation Products: electrification.us.abb.com/#sle.
 - b. Gripple, Inc: www.gripple.com/#sle.
 - c. Unistrut, a brand of Atkore International Inc: www.unistrut.com/#sle.
 - d. Or equal.
 - e. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.
 2. ASTM A653/A653M galvanized steel bracket with clamps for surface mounting of piping or plumbing equipment support.
 3. 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.
 2. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2 inch (13 mm, DN) diameter.
 - b. Piping up to 1 inch (25 mm, DN): 1/4 inch (6 mm, DN) diameter.
 - c. Piping larger than 1 inch (25 mm, DN): 3/8 inch (10 mm, DN) diameter.
 - d. Trapeze Support for Multiple Pipes: 3/8 inch (10 mm) in length.
- C. Cable Hanging System Kits:
 1. Manufacturers:
 - a. B-Line, a brand of Eaton Corporation: www.eaton.com/#sle.
 - b. Ductmate Industries, Inc: ductmate.com/#sle.
 - c. Gripple, Inc: www.gripple.com/#sle.
 - d. Or equal.
 - e. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.
 2. 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).
 3. Accessories: Provide brackets, clip or c-clip hangers, covers, and y-hook hangers.

2.04 BEAM CLAMPS

- A. MSS SP-58 types 19 through 23, 25 or 27 through 30 based on required load.
- B. C-Clamp: MSS SP-58 type 23, malleable iron and steel with plain, stainless steel, and zinc finish.
- C. Small or Junior Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish. For inverted usage provide manufacturer listed size(s).
- D. Wide Mouth Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish.
- E. Centerload Beam Clamp with Extension Piece: MSS SP-58 type 30, malleable iron with plain finish.

- F. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.
- G. 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.
 - 2. Felt-Lined: Provide for uninsulated pipe to reduce noise and prevent static issues.
- 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.
 - 4. Felt-Lined: Provide for uninsulated pipe to reduce noise and prevent static issues.
- 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.
- E. Nonmetallic Pipe Hangers:
 - 1. CPVC fabricated, snap-action hanger for pendant or sidewall applications.

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. 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).
- B. Strut Clamps:
 - 1. Pipe Clamp: Two-piece rigid, universal, or outer diameter type, carbon steel with epoxy copper or zinc finish.
 - 2. Cushioned Pipe or Tubing Strut Clamp: Provide strut clamp with thermoplastic elastomer cushion having dielectric strength of 670 V/mil (26,398,000 V/m).
 - 3. Service Temperature Range: Minus 65 to 275 degrees F (Minus 53.8 to 135 degrees C).
- C. Insulation Coupling:
 - 1. Two bolt-type clamps designed for installation under insulation.
 - 2. Material: Carbon steel with epoxy copper or zinc finish.

2.07 PIPE SUPPORTS, GUIDES, SHIELDS, AND SADDLES

- A. 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.
- B. 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.
- C. U-Bolts:
1. MSS SP-58 type 24, carbon steel u-bolt for pipe support or anchoring.
- D. Pipe Shields for Insulated Piping:
1. MSS SP-58 type 40, ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.
 2. General Construction and Requirements:
 - a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.
 - b. Shields Material: UV-resistant polypropylene with glass fill.
 - c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch (321 mm).
 - d. Service Temperature: Minus 40 to 178 degrees F (Minus 40 to 81 degrees C).
 - e. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
- E. 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 clamps.
 - b. Support From Below: MSS SP-58 types 35 through 38.
- F. Pipe Supports, Thermal Insulated:
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. Provide pipe supports for 1/2 to 30 inch (15 to 750 mm, DN) iron pipes.
 - d. Insulation inserts to consist of rigid phenolic foam insulation surrounded by 360 degree, PVC jacketing.
 2. PVC Jacket:
 - a. Pipe insulation protection shields to be provided with 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. Minimum Thickness: 60 mil, 0.06 inch (1.524 mm).
- G. Overhead Pipe Supports:

2.08 ANCHORS AND FASTENERS

- A. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
- B. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
- C. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
- D. Hollow Masonry: Use toggle bolts.
- E. Hollow Stud Walls: Use toggle bolts.
- F. Steel: Use beam ceiling clamps, beam clamps, machine bolts, or welded threaded studs.
- G. Beam Ceiling Flanges: ASTM A47/A47M Grade 32510, malleable iron or stainless steel with copper, plain, stainless steel, or zinc finish.
- H. Sheet Metal: Use sheet metal screws.
- I. Wood: Use wood screws.

- J. Plastic and lead anchors are not permitted.
- K. Powder-actuated fasteners are not permitted.
- L. Hammer-driven anchors and fasteners are not permitted.
- M. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.
- N. Preset Concrete Inserts: Continuous metal strut channel and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
 - 1. Channel Material: Use galvanized steel.
 - 2. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch (2.66 mm) minimum base metal thickness.
 - 3. Manufacturer: Same as manufacturer of metal strut channel framing system.

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. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
- D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- G. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.
- H. 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. Unless otherwise indicated, mount floor-mounted equipment on properly sized 4 inch (100 mm) high concrete pad constructed in accordance with Section 03 3000.
 - 5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- I. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.
- J. Secure fasteners according to manufacturer's recommended torque settings.
- K. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements for additional requirements.

- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

BUILDING FOR ROGERS FACILITIES DEPARTMENT
ROGERS, AR

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DEMX ARCHITECTURE
FAYETTEVILLE, AR

SECTION 22 0553
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Pipe markers.
- D. Underground warning tape.
- E. Ceiling tacks.

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.

PART 2 PRODUCTS

2.01 PLUMBING COMPONENT IDENTIFICATION GUIDELINE

- A. Nameplates:
 - 1. Heat exchangers, water heaters, and other heat transfer products.
 - 2. Control panels, transducers, and other related control equipment products.
 - 3. Pumps, tanks, filters, water treatment devices, and other plumbing equipment products.
- B. Tags:
 - 1. Piping: 3/4 inch (20 mm) diameter and smaller.
 - 2. Manual operated and automated control valves.
 - 3. Instrumentation, relays, gauges, and other related control equipment products.
 - 4. Ceiling tacks placed on lay-in ceiling surface to reference plumbing components.
- C. Pipe Markers: 3/4 inch (20 mm) diameter and higher.

2.02 NAMEPLATES

- A. Description: Laminated piece with up to three lines of text.
 - 1. Letter Color: White.
 - 2. Letter Height: 1/4 inch (6 mm).
 - 3. Background Color: Black.

2.03 TAGS

- A. Flexible: Vinyl with engraved black letters on light contrasting background color with up to three lines of text. Minimum tag size 1-1/2 inch (40 mm) in diameter.
- B. Metal: Brass, 19 gauge 1-1/2 inch (40 mm) in diameter with smooth edges, blank, smooth edges, and corrosion-resistant ball chain. Up to three lines of text.
- C. Piping: 3/4 inch (20 mm) diameter and smaller. Include corrosion resistant chain. Identify service, flow direction, and pressure.

2.04 PIPE MARKERS

- A. Comply with ASME A13.1.
- B. Flexible Marker: Factory fabricated, semi-rigid, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid conveyed.
- C. Flexible Tape Marker: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

- D. Underground Flexible Marker: Bright-colored continuously printed ribbon tape, minimum 6 inches (150 mm) wide by 4 mil, 0.004 inch (0.10 mm) thick, manufactured for direct burial service.
- E. Identification Scheme, ASME A13.1:
 - 1. Primary: External Pipe Diameter, Uninsulated or Insulated.
 - a. 3/4 to 1-1/4 inches (19 to 32 mm): Use 8 inch (203 mm) field-length with 1/2 inch (13 mm) text height.
 - b. 1-1/2 to 2 inches (38 to 51 mm): Use 8 inch (203 mm) field-length with 3/4 inch (19 mm) text height.
 - c. 2-1/2 to 6 inches (64 to 152 mm): Use 12 inch (305 mm) field-length with 1-1/4 inch (32 mm) text height.
 - 2. Secondary: Color scheme per fluid service.
 - a. Compressed Air: White text on blue background.
 - b. Flammable and Oxidizing Fluids: Black text on yellow background.
 - c. Water; Potable, Cooling, Boiler Feed, and Other: White text on green background.
 - 3. Tertiary: Other Details.
 - a. Directional flow arrow.

2.05 UNDERGROUND WARNING TAPE

- A. Materials: Use foil-backed detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
- B. Foil-backed Detectable Type Tape: 3 inches (76 mm) wide, with minimum thickness of 5 mil, 0.005 inch (0.12 mm), unless otherwise required for proper detection.
- C. Legend: Type of service, continuously repeated over full length of tape.
- D. Color:
 - 1. Tape for Buried Power Lines: Black text on red background.
 - 2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.06 CEILING TACKS

- A. Description: Steel with 3/4 inch (20 mm) diameter color coded head.
- B. Color code as follows:
 - 1. Plumbing Equipment: Yellow.
 - 2. Plumbing Valves: Green.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive identification products.

3.02 INSTALLATION

- A. Install flexible nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags in clear view and align with axis of piping
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe marker around pipe in accordance with manufacturer's instructions.
- E. Install underground plastic pipe markers 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.
- F. Apply ASME A13.1 Pipe Marking Rules:
 - 1. Place pipe marker adjacent to changes in direction.
 - 2. Place pipe marker adjacent each valve port and flange end.
 - 3. Place pipe marker at both sides of floor and wall penetrations.
 - 4. Place pipe marker every 25 to 50 feet (7.6 to 15.2 m) interval of straight run.

- G. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

BUILDING FOR ROGERS FACILITIES DEPARTMENT
ROGERS, AR

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DEMX ARCHITECTURE
FAYETTEVILLE, AR

**SECTION 22 0719
PLUMBING PIPING INSULATION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Glass fiber insulation.
- B. Jacketing and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.

1.03 REFERENCE STANDARDS

- A. 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).
- B. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2024).
- C. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2024).
- D. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2025.
- E. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).
- F. ASTM C1423 - Standard Guide for Selecting Jacketing Materials for Thermal Insulation; 2021.
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.
- H. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- I. SAE AMS3779 - Tape, Adhesive, Pressure-Sensitive Thermal Radiation Resistant, Aluminum Coated Glass Cloth; 2016b.
- J. 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.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum three years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.07 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. Manufacturers:
 - 1. CertainTeed Corporation: www.certainteed.com/#sle.
 - 2. Johns Manville Corporation: www.jm.com/#sle.
 - 3. Knauf Insulation: www.knaufinsulation.com/#sle.
 - 4. Owens Corning Corporation: www.owenscorning.com/en-us/#sle.
 - 5. Or approved equal.
- B. Insulation: ASTM C547 and ASTM C795; rigid, preformed pipe insulation, 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.
- C. Insulation: ASTM C547 and ASTM C795; semi-rigid, v-grooved, 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.
- G. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.
- H. Fibrous Glass Fabric:
 - 1. Cloth: Untreated; 9 oz/sq yd (305 g/sq m) weight.
 - 2. Blanket: 1.0 pcf (16 kg/cu m) density.
 - 3. Weave: 5 by 5.
- I. Indoor Vapor Barrier Finish:
 - 1. Cloth: Untreated; 9 oz/sq yd (305 g/sq m) weight.
 - 2. Vinyl emulsion type acrylic, compatible with insulation, black color.
- J. Insulating Cement: ASTM C449.

2.03 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.
 - 2. Covering Adhesive Mastic: Compatible with insulation.
- B. Reinforced Tape:
 - 1. All Service Jacket tape suitable for sealing seams between insulation, insulated pipe bends, 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.

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. Exposed Piping: Locate insulation and cover seams in least visible locations.
- C. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
- D. Glass fiber insulated pipes conveying fluids below ambient temperature:
 1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- E. Glass fiber insulated pipes conveying fluids above ambient temperature:
 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- F. 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.
 3. Insert Location: Between support shield and piping and under the finish jacket.
 4. Insert Configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.
 5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- G. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 07 8400.
- H. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet (3 meters) above finished floor): Finish with PVC jacket and fitting covers.

3.03 SCHEDULES

- A. Plumbing Systems:
 1. Domestic Hot Water Supply and Recirculation:
 - a. Glass Fiber Insulation:
 - 1) Thickness: 1 inch (25.4 mm).
 2. Domestic Cold Water:
 - a. Glass Fiber Insulation:
 - 1) Thickness: 1/2 inch (12.7 mm)

END OF SECTION

BUILDING FOR ROGERS FACILITIES DEPARTMENT
ROGERS, AR

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DEMX ARCHITECTURE
FAYETTEVILLE, AR

**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. Domestic water piping, buried within 5 feet (1500 mm) of building.
- D. Domestic water piping, above grade.
- E. Natural gas piping, buried within 5 feet (1500 mm) of building.
- F. Natural gas piping, above grade.
- G. Pipe flanges, unions, and couplings.
- H. Pipe hangers and supports.
- I. Ball valves.

1.02 RELATED REQUIREMENTS

- A. Section 08 3100 - Access Doors and Panels.
- B. Section 22 0529 - Hangers and Supports for Plumbing Piping and Equipment.
- C. Section 22 0553 - Identification for Plumbing Piping and Equipment.
- D. Section 22 0719 - Plumbing Piping Insulation.

1.03 REFERENCE STANDARDS

- A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.
- B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
- C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
- D. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings: DWV; 2021.
- E. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings—DWV; 2022.
- F. ASME B16.51 - Copper and Copper Alloy Press-Connect Pressure Fittings; 2021.
- G. ASME B31.1 - Power Piping; 2024.
- H. ASME B31.9 - Building Services Piping; 2025.
- I. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.
- J. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2025.
- K. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2025.
- L. ASTM B32 - Standard Specification for Solder Metal; 2020.
- M. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.
- N. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.
- O. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV); 2026.
- P. ASTM B813 - Standard Specification for Water Flushable Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2024.
- Q. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2023.

- R. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2026.
- S. ASTM C1277 - Standard Specification for Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings; 2020.
- T. ASTM C1540 - Standard Specification for Heavy-Duty Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings; 2020.
- U. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2020 (Reapproved 2024).
- V. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2025.
- W. 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 (Reapproved 2024).
- X. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2024, with Editorial Revision (2025).
- Y. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing; 2026.
- Z. ASTM F877 - Standard Specification for Crosslinked Polyethylene (PEX) Hot- and Cold-Water Distribution Systems; 2025.
- AA. ASTM F1807 - Standard Specification for Metal Insert Fittings Utilizing a Copper Crimp Ring, or Alternate Stainless Steel Clamps, for SDR9 Cross-Linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing; 2023.
- BB. 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; 2024.
- CC. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2018.
- DD. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2023.
- EE. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2023.
- FF. AWWA C651 - Disinfecting Water Mains; 2023.
- GG. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2021.
- HH. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2020.
- II. FM 1680 - Examination Standard for Couplings Used in Hubless Cast Iron Systems for Drain, Waste or Vent, Sewer, Rainwater or Storm Drain Systems Above and Below Ground, Industrial/ Commercial and Residential; 2025.
- JJ. IAPMO (UPC) - Uniform Plumbing Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- KK. IAPMO/ANSI/CAN Z1117 - Standard for Press Connections; 2022.
- LL. ICC (IPC) - International Plumbing Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- MM. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2018, with Editorial Revision (2020).
- NN. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry; 2018, with Editorial Revision (2020).
- OO. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2017, with Editorial Revision (2020).

- PP. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2023.
- QQ. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.
- 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; 2025, with Addendum
- TT. NSF 372 - Drinking Water System Components - Lead Content; 2024.
- 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; 2024.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
- C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements for additional provisions.
 - 2. Valve Repacking Kits: Two for each type and size of valve.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with applicable codes.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.06 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.

1.07 FIELD CONDITIONS

- A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Supply Systems: Provide piping, pipe fittings, solder, and flux (if used), complying with NSF 61 and NSF 372; label pipe and fittings.

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. Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.
- C. Copper Tube: ASTM B306, DWV.
 - 1. Fittings: ASME B16.29, wrought copper, or ASME B16.23, solvent.
 - 2. Joints: ASTM B32, alloy Sn50 solder.
- D. PVC Pipe: ASTM D2665.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.04 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

- A. Copper Pipe: ASTM B88 (ASTM B88M), Type L (Type B), drawn temper.
 - 1. Fittings: ASME B16.18, cast copper, or ASME B16.22, wrought copper.
 - 2. Joints: ASTM B32, solder.
- B. Ductile Iron Pipe: AWWA C151/A21.51.
 - 1. Fittings: Ductile or gray iron, standard thickness.
 - 2. Joints: AWWA C111/A21.11, styrene butadiene rubber (SBR) or vulcanized SBR gasket with 3/4 inch (19 mm) diameter rods.
- C. Cross-Linked Polyethylene (PEX) Pipe: ASTM F876 or ASTM F877.
 - 1. Manufacturers:
 - a. Uponor, Inc: www.uponorengineering.com/#sle.
 - b. Zurn Water, LLC: www.zurn.com/#sle.
 - c. Or approved equal.
 - 2. PPI TR-4 Pressure Design Basis:
 - a. 160 psig (1102 kPa) at maximum 73 degrees F (23 degrees C).
 - 3. PEX Type, Fittings, and Joints:
 - a. PEX-a, Engle method or PEX-b, Silane method; no fittings; use continuous runs of piping.

2.05 DOMESTIC WATER PIPING, ABOVE GRADE

- A. Copper Pipe: ASTM B88 (ASTM B88M), Type L (Type B), drawn temper.
 - 1. Fittings: ASME B16.18, cast copper, or ASME B16.22, wrought copper.
 - 2. Joints: ASTM B32 solder.
 - 3. Mechanical Press Sealed Fittings: ASME B16.51 or IAPMO/ANSI/CAN Z1117, ICC (IPC), and IAPMO (UPC) approved, NSF 61 and NSF 372 certified, with EPDM seals.
- B. Cross-Linked Polyethylene (PEX) Pipe: ASTM F876 or ASTM F877.
 - 1. Manufacturers:
 - a. Uponor, Inc: www.uponorengineering.com/#sle.
 - b. Zurn Water, LLC: www.zurn.com/#sle.
 - c. Or approved equal.
 - 2. 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).
 - 3. PEX Type, Fittings, and Joints:
 - a. PEX-a, Engle method, with brass fittings of the following type:
 - 1) ASTM F1960 cold-expansion fittings.
 - a. PEX-b, Silane method, with brass fittings of the following type:
 - 1) ASTM F1807 brass crimp fittings.

2.06 NATURAL GAS PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

- A. Steel Pipe: ASTM A53/A53M, Grade B, Type F, 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.

2.07 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.

2.08 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. No-Hub Couplings:
 - 1. Testing: In accordance with ASTM C1277 and CISPI 310.
 - 2. Gasket Material: Neoprene complying with ASTM C564.
 - 3. Band Material: Stainless steel.
 - 4. Eyelet Material: Stainless steel.
- D. Shielded, Heavy Duty No-Hub Couplings:
 - 1. Testing: In accordance with ASTM C1540 and FM 1680.
 - 2. Gasket Material: Neoprene complying with ASTM C564.
 - 3. Band Material: Stainless steel.
 - 4. Eyelet Material: Stainless steel.
- E. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.09 PIPE HANGERS AND SUPPORTS

- A. See Section 22 0529 for additional requirements.
- B. 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.
- C. 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.

6. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- D. 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. Wall Support for Pipe Sizes Up to 3 inch (80 mm, DN): Cast iron hook.
 5. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 6. 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.
 7. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- E. 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.
 6. Other Types: As required.

2.10 BALL VALVES

- A. Construction, 4 inch (100 mm, DN) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle, threaded ends with union.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.03 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. Group piping whenever practical at common elevations.
- E. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
 1. See Section 22 0719.
- F. Provide access where valves and fittings are not exposed.
 1. Coordinate size and location of access doors with Section 08 3100.
- G. Provide support for utility meters in accordance with requirements of utility companies.
- H. Prepare exposed, unfinished pipe, fittings, supports, and accessories for finish painting.
- I. Install valves with stems upright or horizontal, not inverted. See Section 22 0523.
- J. Install water piping to ASME B31.9.

- K. 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.
- L. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- M. Sleeve pipes passing through partitions, walls, and floors.
- N. 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.
 - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 mm, DN).
- O. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9.
 - 2. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
 - 3. Place hangers within 12 inches (300 mm) of each horizontal elbow.
 - 4. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 - 6. Provide copper plated hangers and supports for copper piping or sheet lead packing between hanger or support and piping.
 - 7. Support cast iron drainage piping at every joint.
- P. 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.

3.04 APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- C. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- D. Provide spring-loaded check valves on discharge of water pumps.
- E. Provide flow controls in water recirculating systems where indicated.

3.05 TOLERANCES

- A. Water Piping: Slope at minimum of 1/32 inch per foot (1:400) and arrange to drain at low points.

3.06 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. Domestic Water Systems:
 - 1. Perform hydrostatic testing for leakage prior to system disinfection.
 - 2. Test Preparation: Close each fixture valve or disconnect and cap each connected fixture.
 - 3. General:
 - a. Fill the system with water and raise static head to 10 psi (345 kPa) above service pressure. Minimum static head of 50 to 150 psi (345 to 1,034 kPa). As an exception, certain codes allow a maximum static pressure of 80 psi (551.6 kPa).
- C. Gas Distribution Systems:
 - 1. Test Preparation: Close each appliance valve or disconnect and cap each connected appliance.

2. General Systems:
 - a. Inject a minimum of 10 psi (68.9 kPa) of compressed air into the piping system for a duration of 15 minutes and verify with a gauge that no perceptible pressure drop is measured.
 - b. Ensure test pressure gauge has a range of twice the specific pressure rate selected with an accuracy of 1/10 of 1 pound (0.45 kg).

D. Test Results: Document and certify successful results, otherwise repair, document, and retest.

3.07 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Prior to starting work, verify system is complete, flushed, and clean.
- B. 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).
- C. Inject disinfectant, free chlorine in liquid, powder, tablet, or gas form throughout system to obtain 50 to 80 mg/L residual.
- D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- E. Maintain disinfectant in system for 24 hours.
- F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.08 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.

3.09 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).
 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 1119
DOMESTIC WATER PIPING SPECIALTIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Backflow preventers.
- B. Vacuum breakers.
- C. Water pressure reducing valves.
- D. Mixing valves.
- E. Strainers.
- F. Outlet boxes.
- G. Hydrants.
- H. Drain valves.
- I. Water-hammer arrestors.
- J. Trap primers.

1.02 ABBREVIATIONS AND ACRONYMS

- A. DZR: Dezincification resistant.

1.03 REFERENCE STANDARDS

- A. ASSE 1001 - Performance Requirements for Atmospheric Type Vacuum Breakers; 2021.
- B. ASSE 1003 - Water Pressure Reducing Valves for Potable Water Distribution Systems; 2023.
- C. ASSE 1010 - Performance Requirements for Water Hammer Arresters; 2025.
- D. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers; 2023.
- E. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Prevention Assemblies; 2021.
- F. ASSE 1016 - Performance Requirements for Automatic Compensating Valves for Individual Showers and Tub/Shower Combinations; 2017 (Reaffirmed 2021).
- G. ASSE 1018 - Performance Requirements for Trap Seal Primer Valves - Potable Water Supplied; 2023.
- H. ASSE 1019 - Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance; 2023.
- I. ASSE 1020 - Performance Requirements for Pressure Vacuum Breaker Assemblies; 2020 (Reaffirmed 2025).
- J. ASSE 1052 - Performance Requirements for Hose Connection Backflow Preventers; 2023.
- K. ASSE 1053 - Performance Requirements for Dual Check Backflow Preventer Wall Hydrants - Freeze Resistant Type; 2019 (Reaffirmed 2023).
- L. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2020.
- M. AWWA C511 - Reduced-Pressure Principle Backflow Prevention Assembly; 2017 (Reaffirmed 2021).
- N. NSF 61 - Drinking Water System Components - Health Effects; 2025, with Addendum
- O. NSF 372 - Drinking Water System Components - Lead Content; 2024.
- P. PDI-WH 201 - Water Hammer Arresters; 2017.

1.04 SUBMITTALS

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

- B. Product Data: Provide manufacturer's literature and data sheets for each product. Include information on materials of fabrication, assembly of components, dimensions, ratings, finishes, rough-in requirements, and installed accessories.
- C. Maintenance Materials: Furnish the following for Owner's use in project maintenance:
 - 1. See Section 01 6000 - Product Requirements for additional provisions.
 - 2. Extra Loose Keys for Hydrants: Two.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. See Section 01 7419 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.
- C. Keep products in original manufacturer's packaging and protect from damage until ready for installation.
- D. Store products under cover and protected from weather and dirt. Elevate above grade.
- E. Protect end connections, flanges, threads, and grooves from dirt and damage.
- F. Protect product interiors against rust and corrosion.
- G. Do not use operating handles or stems as lifting or rigging points.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Specialties in Potable Water Supply Systems: Provide products complying with NSF 61 and NSF 372.
- B. Source Limitations: Furnish domestic water piping specialties of same kind by same manufacturer.
- C. Provide brass-bodied domestic water piping specialties in DZR brass.

2.02 BACKFLOW PREVENTERS

- A. Reduced-Pressure-Principle Backflow Preventers:
 - 1. Manufacturers:
 - a. Watts: www.watts.com/#sle.
 - b. Wilkins by Zurn Water, LLC: www.zurn.com/#sle.
 - c. Or approved equal.
 - 2. NPS 2 (DN 50) and Smaller:
 - a. Assembly: ASSE 1013 and AWWA C511.
 - b. Backflow Valve: Manufactured from bronze, copper silicon alloy, or stainless steel.
 - c. Isolation Valves: Ball valves on inlet and outlet.
 - d. Maximum Working Pressure: 175 psi (12.1 bar).
 - e. Working Temperature Range: 33 to 180 degrees F (0.5 to 82 degrees C).
 - f. Accessories:
 - 1) Air gap fitting.
 - 2) Inlet strainer.

2.03 VACUUM BREAKERS

- A. Atmospheric Vacuum Breakers:
 - 1. Valve: ASSE 1001, brass, bronze, or copper silicon alloy.
 - 2. Maximum Working Pressure: 125 psi (8.6 bar).
 - 3. Working Temperature Range: 33 to 180 degrees F (0.5 to 82 degrees C).
- B. Hose-Connection Vacuum Breakers:
 - 1. Valve: ASSE 1011, brass, nonremovable, drainable, with hose-thread end connections.
 - 2. Maximum Working Pressure: 125 psi (8.6 bar).
 - 3. Working Temperature Range: 33 to 180 degrees F (0.5 to 82 degrees C).

- C. Pressure Vacuum Breakers:
 - 1. Valve: ASSE 1020, bronze or copper silicon alloy.
 - 2. Maximum Working Pressure: 150 psi (10.3 bar).
 - 3. Working Temperature Range: 33 to 140 degrees F (0.5 to 60 degrees C).

2.04 WATER PRESSURE REDUCING VALVES

- A. Direct-Acting Pressure Reducing Valves:
 - 1. Manufacturers:
 - a. Cash Acme, a brand of Reliance Worldwide Corporation: www.cashacme.com/#sle.
 - b. Wilkins by Zurn Water, LLC: www.zurn.com/#sle.
 - c. Or approved equal.
 - 2. Valve: ASSE 1003, bronze or copper silicon alloy body, with spring-loaded diaphragm; field-adjustable outlet pressure, and integral inlet screen strainer.
 - a. Diaphragm: EPDM or buna-nitrile.
 - b. Spring: Stainless steel.
 - 3. Maximum Working Pressure: 300 psi (20.7 bar).
 - 4. Outlet Pressure Range: 15 to 75 psi (100 to 515 kPa).
 - 5. Working Temperature Range: 33 to 140 degrees F (0.5 to 60 degrees C).

2.05 MIXING VALVES

- A. Water Temperature Limiting Valves:
 - 1. Manufacturers:
 - a. Cash Acme, a brand of Reliance Worldwide Corporation: www.cashacme.com/#sle.
 - b. Watts: www.watts.com/#sle.
 - c. Or approved equal.
 - 2. Valve: ASSE 1070, bronze body; thermostatic element; corrosion- and lime-resistant internal components; integral locking temperature adjustment with high-temperature limit stop; integral check valves with strainer screens on inlets.
- B. Automatic Compensating Valves for Individual Showers and Combination Tub-Showers:
 - 1. Valve: ASSE 1016, pressure balancing, brass or bronze body with inlet checkstops; integral volume and temperature control with adjustable high-temperature limit stop.
 - 2. Valve Trim: Escutcheon with ADA-compliant lever handle.

2.06 STRAINERS

- A. NPS 2 (DN 50) and Smaller:
 - 1. Body: Wye-pattern in bronze.
 - 2. Screen: Stainless steel mesh.
 - 3. Pressure Rating: 200 psi (13.8 bar).

2.07 OUTLET BOXES

- A. Washing Machine Outlet Boxes:
 - 1. Manufacturers:
 - a. Guy Gray: www.ipsplumbingproducts.com/brands/guy-gray/#sle.
 - b. HoldRite, a brand of Reliance Worldwide Corporation: www.holdrite.com/#sle.
 - c. Or approved equal.
 - 2. Description: Galvanized rough-in box with brass quarter-turn ball valves, socket for 2-inch (50 mm) waste, and slip-in finishing cover.
 - 3. Provide fire-rated outlet-box assembly for installation in 1- and 2-hour rated walls.
 - 4. Accessories:
 - a. Water-hammer arrestors.
 - b. Support brackets for installation between framing studs.
- B. Ice Maker Outlet Boxes:
 - 1. Manufacturers:
 - a. Guy Gray: www.ipsplumbingproducts.com/brands/guy-gray/#sle.

- b. HoldRite, a brand of Reliance Worldwide Corporation: www.holdrite.com/#sle.
 - c. Or approved equal.
- 2. Description: Metal powder coated square rough-in box with quarter-turn ball valve and slip-in finishing cover.
- 3. Provide fire-rated outlet-box assembly for installation in 1- and 2-hour-rated walls.
- 4. Accessories:
 - a. Water-hammer arrestors.
 - b. Support brackets for installation between framing studs.

2.08 HYDRANTS

- A. Wall Hydrants:
 - 1. Manufacturers:
 - a. Woodford Manufacturing: www.woodfordmfg.com/#sle.
 - b. Zurn Water, LLC: www.zurn.com/#sle.
 - c. Or approved equal.
 - 2. Assembly: ASSE 1011, ASSE 1019, ASSE 1052, or ASSE 1053.
 - 3. Hydrant: Freeze-resistant, self-draining, wall-mounted.
 - a. Valve: Bronze or brass body.
 - b. Hose Connection: Threaded, with integral vacuum breaker or backflow preventer.
 - c. Hose Connection Size: 3/4 inch (19 mm).
 - d. Installation: Recessed lockable box.
 - e. Exterior Finish: Stainless steel.
 - f. Operation: Loose key.
 - 4. Maximum Working Pressure: 125 psi (8.6 bar).
 - 5. Working Temperature Range: 33 to 120 degrees F (0.5 to 50 degrees C).

2.09 DRAIN VALVES

- A. Ball-Valve Hose-End Drain Valves:
 - 1. Valve: Two-piece, full-port ball valve in bronze with capped hose-end connection.
 - 2. Pressure Rating: 250 psi (17.2 bar).
 - 3. Working Temperature Range: 33 to 140 degrees F (0.5 to 60 degrees C).
- B. Stop-and-Drain Valves:
 - 1. Ball-Valve Type:
 - a. Valve: Two-piece, full-port ball valve in bronze with capped drain port.
 - b. Pressure Rating: 600 psi (41.4 bar).
 - c. Working Temperature Range: 33 to 140 degrees F (0.5 to 60 degrees C).
 - 2. Globe-Valve Type:
 - a. Valve: Globe valve in bronze with capped drain port.
 - b. Pressure Rating: 125 psi (8.6 bar).
 - c. Working Temperature Range: 33 to 140 degrees F (0.5 to 60 degrees C).

2.10 WATER-HAMMER ARRESTORS

- A. Manufacturers:
 - 1. Watts: www.watts.com/#sle.
 - 2. Zurn Water, LLC: www.zurn.com/#sle.
 - 3. Or approved equal.
- B. Piston Type:
 - 1. Description: ASSE 1010 or PDI-WH 201, copper body with plastic piston and EPDM O-rings.
 - 2. Air Preload Pressure: 60 psi (410 kPa).
 - 3. Maximum Working Pressure: 150 psi (10.3 bar).
 - 4. Working Temperature Range: 33 to 180 degrees F (0.5 to 82 degrees C).

2.11 TRAP PRIMERS

- A. Water-Supplied Trap Primers:
 - 1. Description: ASSE 1018, bronze or brass body, water-supplied, pressure-drop activated trap primer with internal filter screen and integral vacuum breaker.
 - 2. Operating Pressure Range: 20 to 80 psi (140 to 550 kPa).
 - 3. Activation Pressure Drop: 3 psi (20 kPa).
 - 4. Accessories:
 - a. Shutoff valve on inlet.
 - b. Manufacturer's distribution unit with four outlet ports.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Discard packing materials and verify product interiors are free from debris, damage, and corrosion.
- B. Verify end connections, flanges, threads, and grooves are completely clean without signs of damage or degradation that could result in leakage.
- C. For products containing isolation or shutoff valves, verify isolation and shutoff valves operate smoothly from fully closed to fully open.

3.02 INSTALLATION

- A. Prior to installation of domestic water piping specialties, flush domestic water piping of foreign material.
- B. Install products in accordance with manufacturer's instructions.
- C. Install products level and plumb.
- D. Install products with clearance for access and maintenance.
- E. Support products NPS 2-1/2 (DN 65) and larger independently of surrounding pipe.
- F. Support products with flanged or grooved ends independently of surrounding pipe.
- G. For products containing isolation or shutoff valves, locate valves in horizontal piping with stems at or above center of piping, maintaining unimpeded stem movement.
- H. Backflow Preventers:
 - 1. Install backflow preventers in accordance with requirements of local authorities having jurisdiction, including requirements of local water utility.
 - 2. Pipe relief from reduced-pressure-principle backflow preventers to nearest drain.
- I. Water Pressure Reducing Valves:
 - 1. Install shutoff valves on inlet and outlet.
 - 2. Install pressure gauges on outlet.
- J. Water Hammer Arrestors: Install in accordance with PDI-WH 201.
- K. Trap Primers:
 - 1. Install trap primers minimum of 12 inches (205 mm) above flood level of highest drain being served.
 - 2. Check that water flows through piping and that there are no leaks before pouring slabs or closing in walls.
 - 3. Cap unused ports on distribution manifold.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements for additional requirements.
- B. Inspect each product for damage and defects.
- C. Repair or replace damaged products.
- D. Replace defective products.

- E. For products containing isolation or shutoff valves, exercise isolation and shutoff valves from fully closed to fully open. Confirm smooth operation.
- F. Backflow Preventers:
 - 1. Test in accordance with manufacturer's instructions.
 - 2. Test in accordance with requirements of authorities having jurisdiction.
 - 3. Test in accordance with ASSE listing of backflow preventer.
 - 4. Replace backflow preventers that fail testing.
- G. Vacuum Breakers:
 - 1. Test in accordance with manufacturer's instructions.
 - 2. Test in accordance with requirements of authorities having jurisdiction.
 - 3. Test in accordance with ASSE listing of vacuum breaker.
 - 4. Replace vacuum breakers that fail testing.
- H. Water Pressure Reducing Valves: Confirm outlet pressure remains steady without fluctuation.
- I. Mixing Valves: Confirm outlet temperature remains steady without fluctuation.
- J. Coordination of Other Tests and Inspections: Provide access to accommodate tests and inspections by independent testing agencies employed by Owner.

3.04 ADJUSTING

- A. Adjust pressure reducing valves to design pressure set point.
- B. Adjust mixing valves to design temperature set point.
- C. Adjust thermostatic balancing valves to design temperature setpoint.

3.05 CLEANING

- A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.
- B. Clean products to remove dirt, paint, and other foreign materials.
- C. Clean surfaces of products exposed to view in finished spaces to remove dirt, fingerprints, paint, and other foreign materials. Restore finishes to match original factory finish.
- D. Clean surfaces of products exposed to view on building exterior to remove dirt, fingerprints, paint, and other foreign materials. Restore finishes to match original factory finish.
- E. Remove debris and clean interiors of equipment cabinets.
- F. Clean strainers, including those internal to other products, prior to mm-dd-yyyy.

3.06 PROTECTION

- A. Protect installed products from damage due to subsequent construction operations.

END OF SECTION

**SECTION 22 1319
SANITARY WASTE PIPING SPECIALTIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Floor drains.
- B. Cleanouts.

1.02 REFERENCE STANDARDS

- A. ASME A112.6.3 - Floor Drains; 2022.
- B. ASME A112.36.2 - Cleanouts; 2022.
- C. ASSE 1072 - Performance Requirements for Barrier Type Floor Drain Trap Seal Protection Devices; 2025, with Editorial Revision.
- D. NSF 14 - Plastics Piping System Components and Related Materials; 2025.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's literature and data sheets for each product. Include information on fabrication materials, assembly of components, dimensions, ratings, finishes, rough-in requirements, and installed accessories.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. See Section 01 7419 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.
- C. Keep products in original manufacturer's packaging and protect from damage until ready for installation.
- D. Store products under cover and protected from weather and dirt. Elevate above grade.
- E. Store plastic products protected from direct sunlight.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Plastic Sanitary Waste Piping Specialties: Provide plastic products that comply with NSF 14.
- B. Source Limitations: Furnish drains and sanitary waste piping specialties of same kind by same manufacturer.

2.02 FLOOR DRAINS

- A. Cast Iron Floor Drains:
 - 1. Manufacturers:
 - a. MIFAB, Inc: www.mifab.com/#sle.
 - b. Zurn Water, LLC: www.zurn.com/#sle.
 - c. Or approved equal.
 - 2. Assembly: ASME A112.6.3.
 - 3. Body: Lacquered cast iron with anchor flange and membrane clamping collar with weepholes.
 - 4. Strainer: Adjustable, removable.
 - 5. Products: As indicated on drawings.

2.03 CLEANOUTS

- A. Manufacturers:
 - 1. MIFAB, Inc: www.mifab.com/#sle.
 - 2. Zurn Water, LLC: www.zurn.com/#sle.

3. Or approved equal..
- B. Floor Cleanouts:
 1. Assembly: ASME A112.36.2.
 2. Body: Lacquered cast iron.
 3. Closure Plug: PVC or ABS, threaded, gastight and watertight.
 4. Top: Adjustable.
 - a. Shape and Finish:
 - 1) All Locations, Unless Noted Otherwise: Round; nickel bronze.
 - 2) Carpet: Round; cover recessed for carpet inlay.
 - 3) Warehouse: Heavy duty; round; cast iron, ductile iron, or nickel bronze.
 5. Accessories:
 - a. Clamp ring and flange for floors with waterproofing membrane.
- C. Wall Cleanouts:
 1. Assembly: ASME A112.36.2.
 2. Body: Tee type; body material to match surrounding pipe.
 3. Plug: Bronze, threaded, gastight.
 4. Access Cover: Round, stainless steel wall access cover.

2.04 MISCELLANEOUS SANITARY WASTE PIPING SPECIALTIES

- A. Floor Drain Trap Seals:
 1. Manufacturers:
 - a. MIFAB, Inc; MI-GARD: www.mifab.com/#sle.
 - b. Zurn Water, LLC; Z1072: www.zurn.com/#sle.
 - c. Or approved equal.
 2. Assembly: ASSE 1072.
 3. Description: Push-fit EPDM or silicone fitting with one-way-flow membrane or flapper.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Maintain continuity of waterproofing membranes. Secure waterproofing membranes to drain clamping collars and bonding flanges.
- C. Install drains so strainers and grates are level and are at design elevation.
- D. Extend cleanouts to finished floor or wall surface. Ensure clearance at cleanout for rodding or jetting of drainage system.
- E. Install floor cleanouts to allow for floor finishes.
- F. Locate, provide, and install cleanouts in piping in accordance with adopted code.

3.03 CLEANING

- A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.
- B. Clean debris from drains.

3.04 PROTECTION

- A. Protect installed drains from accumulating dirt and debris through remainder of construction.
- B. Protect installed products from damage due to subsequent construction operations.

END OF SECTION

SECTION 22 1500
GENERAL-SERVICE COMPRESSED-AIR SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Reciprocating air compressors.
- B. System filters.
- C. Air dryers.
- D. Pipe and fittings.
- E. Unions and couplings.
- F. Pressure reducing stations.
- G. Air outlets.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete.
- B. Section 22 0523 - General-Duty Valves for Plumbing Piping.

1.03 REFERENCE STANDARDS

- A. ASME B31.1 - Power Piping; 2024.
- B. ASME B31.3 - Process Piping; 2024.
- C. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube; 2022.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturers catalog literature with capacity, weight, and electrical characteristics and connection requirements.
- 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.
- B. Pressure Vessels: Comply with applicable code for installation of pressure vessels.
- C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept air compressors, refrigerated air dryer on site in factory-fabricated containers with shipping skids and plastic pipe end protectors in place. Inspect for damage.
- B. Protect piping and equipment from weather and construction traffic.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Provide five year manufacturer warranty for reciprocating air compressors.

PART 2 PRODUCTS

2.01 RECIPROCATING AIR COMPRESSORS

- A. Manufacturers:
 - 1. FS-Curtis: us.fscurtis.com/#sle.
 - 2. Ingersoll Rand, Inc: www.ingersollrandproducts.com/#sle.

3. Kaeser Compressors, Inc: us.kaeser.com/#sle.
 4. Quincy Compressor, LLC: quincycompressor.com/#sle.
 5. Or approved equal.
- B. Type: Simplex air compressor system with fixed belt-driven mechanism.
- C. Capacity: As indicated on drawings.
- D. Electrically driven, two-stage air-cooled compressor unit; factory-assembled with air intake, intake filters, air-cooled after-cooler, low-oil level switch, vibration isolators, controls, and safeties.
- E. Mounting: Tank mounted.

2.02 SYSTEM FILTERS

- A. Manufacturers:
1. Atlas Copco USA: www.atlascopco.com/#sle.
 2. Beko Sales: www.bekosales.com/#sle.
 3. Ingersoll Rand, Inc: www.ingersollrandproducts.com/#sle.
 4. Kaeser Compressors, Inc: us.kaeser.com/#sle.
 5. Or approved equal.
- B. Cartridge Number 1: Coalescing, 1 micron.
- C. Cartridge Number 2: Coalescing, 0.01 micron high-efficiency.
- D. Location: As indicated on drawings.
- E. Flow Capacity: Match air dryer capacity.
- F. Accessories: Include housing-built differential pressure indicator. Provide filter housings with internal automatic float drains.

2.03 AIR DRYERS

- A. Manufacturers:
1. Atlas Copco USA: www.atlascopco.com/#sle.
 2. Beko Sales: www.bekosales.com/#sle.
 3. Ingersoll Rand, Inc: www.ingersollrandproducts.com/#sle.
 4. Kaeser Compressors, Inc: us.kaeser.com/#sle.
 5. Or approved equal.
- B. Type: Self-contained mechanical refrigeration type complete with heat exchanger, refrigeration compressor, automatic controls, moisture removal trap, internal wiring and piping, and full refrigerant charge.
- C. Air Connections: Inlet and outlet connections at same level, factory insulated.
- D. Heat Exchangers: Air-to-air and refrigerant-to-air coils. Provide heat exchangers with automatic control system to bypass refrigeration system on low or no-load condition.
- E. Moisture Separator: Centrifugal type located at discharge of heat exchanger.
- F. Refrigeration Unit: Hermetically sealed type to operate continuously to maintain specified 38 degrees F (3 degrees C) dew point. House unit in steel cabinet provided with access door and panel for maintenance and inspection.
- G. Accessories: Microprocessor-based digital controller with dew point display and energy-saving status.
- H. Capacity: As indicated on drawings.
1. Discharge Air: 38 degrees F (3 degrees C) atmospheric dew point.
 2. Rated Air Flow: 30 cfm (14.2 L/sec).
 3. Inlet Air Pressure: 175 psi (1207 kPa).
- I. Electrical Characteristics:
1. 120 volts, single phase, 60 Hz.

- J. Cord and Plug: Provide unit with 6 foot (2 m) cord and plug for connection to electric wiring system including grounding connector.

2.04 PIPE AND FITTINGS

- A. Aluminum Tube:
 - 1. Manufacturers:
 - a. Aircom: www.aircom.us.com/#sle.
 - b. Applied System Technologies: appliedsystemtech.com/#sle.
 - c. Prevost Corporation: www.prevostusa.com/#sle.
 - d. Or approved equal.
 - e. Source Limitations: Furnish tubing, fittings, and joints produced by single manufacturer and obtained from single supplier.
 - 2. Tube: ASTM B241/B241M, ASME B31.1, ASME B31.3.
 - 3. Alloy: 6063-T5, 6063-T6, or 6060-T51.
 - 4. Maximum Working Pressure: 232 psi (16 bar).
 - 5. Finish: Powder coated or electrostatically painted in blue.
 - 6. Fittings and Joints:
 - a. Material: Provide fittings in aluminum, thermoplastic polymer, or stainless steel.
 - b. Joints: Removeable and reusable, gasketed, mechanical, push-connect type with bite ring, clamshell type, or bolted compression type.
 - c. Gaskets and Seals:

2.05 UNIONS AND COUPLINGS

- A. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
- B. Flexible Connector: Neoprene with brass threaded connectors.

2.06 PRESSURE REDUCING STATIONS

- A. Pressure Reducing Station: Consisting of automatic reducing valve and bypass and low pressure side relief valve and gauge.
- B. Valve Capacity: Reduce pressure from 200 psi (1379 kPa) to 30 psi (207 kPa), adjustable upwards from reduced pressure.

2.07 AIR OUTLETS

- A. Quick Connector: 3/8 inch (10 mm) brass, snap-on connector with self closing valve, Style A.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install equipment in accordance with manufacturer's instructions.
- B. Install compressor unit on concrete housekeeping pad. See Section 03 3000.
- C. Install line size gate valve and check valve on compressor discharge. See Section 22 0523.
- D. Install valved bypass around air dryer. Factory insulate inlet and outlet connections. See Section 22 0523.
- E. Install valved drip connections at low points of piping system. See Section 22 0523.

3.02 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Compressed Air Piping Leak Test: Prior to initial operation, clean and test compressed air piping in accordance with ASME B31.1.
- C. Repair or replace compressed air piping as required to eliminate leaks, and retest to demonstrate compliance.

- D. Cap and seal ends of piping when not connected to mechanical equipment.

END OF SECTION

SECTION 22 3000 PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Commercial electric water heaters.
- B. Diaphragm-type compression tanks.
- C. In-line circulator pumps.

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.
- B. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels; 2025, with Errata .
- C. AWWA C652 - Disinfection of Water-Storage Facilities; 2019.
- D. UL 174 - Standard for Household Electric Storage Tank Water Heaters; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittals procedures.
- B. Product Data:
 - 1. Product Data: Provide manufacturer's literature and data sheets for each product. Include information on materials of fabrication, assembly of components, dimensions, weights, capabilities, performance, electrical characteristics, location and sizes of connections, service and access locations, and manufacturer-provided and field-installed accessories.
- C. Manufacturer's qualification statement.
- D. Warranty Documentation: Submit manufacturer warranty and ensure that 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.
- B. Certifications:
 - 1. Water Heaters: NSF approved.
 - 2. Electric Water Heaters: UL listed and labeled to UL 174.
 - 3. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 5-year manufacturer warranty for domestic water heaters. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 WATER HEATERS

- A. Manufacturers:
 - 1. A.O. Smith Corporation: www.hotwater.com/#sle.
 - 2. Bradford White Corporation: www.bradfordwhite.com/#sle.
 - 3. Rheem Manufacturing Company: www.rheem.com/#sle.
 - 4. Or approved equal.
- B. Commercial Electric Water Heaters:
 - 1. Type: Factory-assembled and wired, electric, vertical storage.
 - 2. Minimum Efficiency Required: ASHRAE Std 90.1 I-P.
 - 3. Performance: As indicated on drawings.
 - 4. Electrical Characteristics: As indicated on drawings.
 - 5. Tank: Glass lined welded steel; 4 inch (100 mm) diameter inspection port, thermally insulated with minimum 2 inches (50 mm) glass fiber encased in corrosion-resistant steel jacket; baked-on enamel finish.
 - 6. Controls: Automatic immersion water thermostat; externally adjustable temperature range from 60 to 180 degrees F (16 to 82 degrees C), flanged or screw-in nichrome elements, high temperature limit thermostat.
 - 7. Accessories:
 - a. Drain valve.
 - b. Anode: Magnesium.
 - c. Temperature and Pressure Relief Valve: ASME labeled.
 - 8. Heating Elements: Flange-mounted immersion elements; individual elements sheathed with Incoloy corrosion-resistant metal alloy, rated less than 75 W/sq in (11.6 W/sq m).

2.02 DIAPHRAGM-TYPE COMPRESSION TANKS

- A. Manufacturers:
 - 1. Amtrol Inc: www.amtrol.com/#sle.
 - 2. Bell & Gossett, a brand of Xylem, Inc: www.bellgossett.com/#sle.
 - 3. Taco, Inc: www.taco-hvac.com/#sle.
 - 4. Watts: www.watts.com/#sle.
 - 5. Or approved equal.
- B. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; supplied with National Board Form U-1, rated for working pressure of 125 psi (860 kPa), with flexible butyl rubber diaphragm sealed into tank, and steel legs or saddles.
- C. Accessories: Pressure gauge and air-charging fitting, tank drain; precharge to match domestic water static pressure prior to installation.

2.03 IN-LINE CIRCULATOR PUMPS

- A. Manufacturers:
 - 1. Armstrong Fluid Technology: www.armstrongfluidtechnology.com/#sle.
 - 2. Bell & Gossett, a brand of Xylem, Inc: www.bellgossett.com/#sle.
 - 3. Or approved equal.
- B. Casing: Bronze, rated for 125 psi (860 kPa) working pressure, with stainless steel rotor assembly.
- C. Impeller: Bronze.
- D. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.
- E. Seal: Carbon rotating against a stationary ceramic seat.
- F. Drive: Flexible coupling.
- G. Performance: As indicated on drawings.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions required for applicable certifications.
- B. Coordinate system, equipment, and piping work with applicable electrical, drain, and waste support interconnections as included or provided by other trades.
- C. Pumps:
 - 1. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

3.02 CLEANING

- A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.
- B. Clean interior of water tanks and disinfect in accordance with AWWA C652.

END OF SECTION

BUILDING FOR ROGERS FACILITIES DEPARTMENT
ROGERS, AR

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DEMX ARCHITECTURE
FAYETTEVILLE, AR

**SECTION 22 4000
PLUMBING FIXTURES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Flush valve water closets.
- B. Lavatories.
- C. Sinks.
- D. Supply stops.
- E. Under-lavatory pipe supply covers.
- F. Bi-level, electric water coolers.
- G. Mop sinks.

1.02 RELATED REQUIREMENTS

- A. Section 22 1119 - Domestic Water Piping Specialties.

1.03 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration; 2008 (Reaffirmed 2013).
- C. ASME A112.6.1M - Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2017).
- D. ASME A112.18.1 - Plumbing Supply Fittings; 2024.
- E. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures; 2011 (Reaffirmed 2022).
- F. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2024.
- G. ASME A112.19.3 - Stainless Steel Plumbing Fixtures; 2022.
- H. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks; 2022.
- I. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2020.
- J. 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).
- K. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.
- L. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping; 2021.
- M. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.
- N. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).
- O. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- P. NSF 61 - Drinking Water System Components - Health Effects; 2025, with Addendum
- Q. NSF 372 - Drinking Water System Components - Lead Content; 2024.
- R. 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 literature and data sheets for each product. Include materials of fabrication, rough-in requirements, location and sizes of connections, configurations, dimensions, finishes, features, and accessories.
 - 1. For electrically powered fixtures, include electrical characteristics.
- C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- D. 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 Faucet Washers: One set of each type and size.
 - 3. Extra Lavatory Supply Fittings: One set of each type and size.
 - 4. Flush Valve Service Kits: One for each type and size.

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 drinking water system components certified as complying with NSF 61 and NSF 372.
- B. ADA: Where indicated to be ADA-compliant, provide fixtures complying with ADA Standards and ICC A117.1.
- C. Maximum Fixture Supply Pressure: 80 psi (550 kPa) unless stated otherwise.

2.02 REGULATORY REQUIREMENTS

- A. Comply with applicable codes for installation of plumbing systems.
- B. Comply with UL (DIR) requirements.
- C. Perform work in accordance with local health department regulations.
- D. Provide certificate of compliance from Authority Having Jurisdiction indicating approval of installation.

2.03 FLUSH VALVE WATER CLOSETS

- A. Water Closets:
 - 1. Vitreous china, ASME A112.19.2, floor mounted, siphon jet flush action, china bolt caps.
 - 2. Bowl: ASME A112.19.2; 16.5 inches (420 mm) high with elongated rim.
 - 3. Flush Valve: Exposed (top spud).
 - 4. Flush Operation: Sensor operated.
 - 5. Handle Height: 44 inches (1117 mm) or less.
 - 6. Inlet Size: 1-1/2 inches (38 mm).
 - 7. Trapway Outlet: 4 inch (100 mm, DN).
 - 8. Color: White.
 - 9. Manufacturers:
 - a. American Standard: www.americanstandard-us.com/#sle
 - b. Kohler Company: www.kohler.com/#sle

- c. Zurn Water, LLC: www.zurn.com/#sle.
 - d. Or approved equal.
- B. Flush Valves:
 - 1. Valve Supply Size: 1 inch (25 mm, DN).
 - 2. Valve Outlet Size: 1-1/2 inches (40 mm, DN).
 - 3. Manufacturers:
 - a. Sloan Valve Company: www.sloanvalve.com/#sle.
 - b. Toto USA: www.totousa.com/#sle.
 - c. Zurn Water, LLC; ZEMS Series: www.zurn.com/#sle.
 - d. Or approved equal.
 - 4. Sensor-Operated:
 - a. Type: ASME A112.19.5; chloramine-resistant diaphragm valve complete with vacuum breaker, stops and accessories.
 - b. Mechanism: Solenoid-operated piston or electronic motor-actuated operator with battery powered infrared sensor, and mechanical override or override push button.
 - c. Supplied Volume Capacity: 1.6 gal (6.1 L) per flush.
 - 5. Exposed Type: Chrome-plated, escutcheon, integral screwdriver stop.
- C. Toilet Seats:
 - 1. Manufacturers:
 - a. American Standard: www.americanstandard-us.com/#sle.
 - b. Bemis Manufacturing Company: www.bemismfg.com/#sle.
 - c. Zurn Water, LLC: www.zurn.com/#sle.
 - d. Or approved equal.
 - 2. Plastic: White finish, open front, extended back, self-sustaining hinge, brass bolts, with cover.

2.04 LAVATORIES

- A. Manufacturers:
 - 1. American Standard: www.americanstandard-us.com/#sle.
 - 2. Kohler Company: www.kohler.com/#sle.
 - 3. Zurn Water, LLC: www.zurn.com/#sle.
 - 4. Or approved equal.
- B. Wall-Hung Bathroom Sink:
 - 1. Vitreous China, Grade A: ASME A112.19.2; white, rectangular commercial-grade sink with predrilled holes, rear-center drain, front overflow, and hanger. Size as indicated on drawings with 4-inch (100 mm) centerset spacing.
 - 2. Carrier:
 - a. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, concealed arm supports, bearing plate and studs.
 - b. Manufacturers:
 - 1) Jay R. Smith MFG. Co: www.jrsmith.com/#sle.
 - 2) JOSAM Company: www.josam.com/#sle.
 - 3) Zurn Water, LLC: www.zurn.com/#sle.
 - 4) Or approved equal.
- C. Supply Faucet:
 - 1. Deck Mounted Faucet Manufacturers:
 - a. American Standard: www.americanstandard-us.com/#sle
 - b. Kohler Company: www.kohler.com/#sle.
 - c. Zurn Water, LLC: www.zurn.com/#sle.
 - d. Or approved equal.
 - 2. ASME A112.18.1; chrome plated combination supply fitting with open grid strainer, water economy aerator with maximum flow of 0.5 gpm (1.9 L/min), indexed handles.

- D. Thermostatic Mixing Valve:
 - 1. ASSE 1070 water temperature limiting valve.
 - 2. See Section 22 1119 for mixing valve specifications.
- E. Accessories:
 - 1. Offset waste with perforated open strainer.
 - 2. Slip-joint P-trap.
 - 3. Chrome-plated 17 gauge, 0.0538 inch (1.37 mm) brass P-trap with clean-out plug, tailpiece, and escutcheon.
 - 4. Wheel handle stops.
 - 5. Rigid supplies.

2.05 SINKS

- A. Manufacturers:
 - 1. Elkay: www.elkay.com/#sle.
 - 2. Just Manufacturing:
 - 3. Or approved equal.
- B. Double Compartment Bowl:
 - 1. ASME A112.19.3; 29 by 18 by _____ inch (_____ by _____ by _____ mm) outside dimensions, 18 gauge, 0.050 inch (1.27 mm) thick, type 304 stainless steel, self-rimming and undercoated, with ledge back drilled for trim.
 - 2. Drain: 3-1/2 inch (90 mm) crumb cup and tailpiece.
- C. Faucets:
 - 1. Manufacturers:
 - a. American Standard: www.americanstandard-us.com/#sle
 - b. Kohler Company: www.kohler.com/#sle.
 - c. Zurn Water, LLC: www.zurn.com/#sle.
 - d. Or approved equal.
 - 2. Single Handle Faucet with Four-Function Pulldown Spray Head:
 - a. Minimum Spout Height: 9 inch (228.6 mm).
 - b. Minimum Spout Reach: 8-1/4 inch (209.6 mm).
 - c. Type: Deck-mount, swivel faucet with mounting plate.
 - d. Spray Functions: Stream, full spray, mist, jet, and pause at 1.8 gpm (6.8 L/min), maximum.
 - e. ASME A112.18.1, ADA Standards, and NSF 61 compliant assembly.
 - f. Materials: Ceramic disc-cartridge valve on brass body with polished chrome finish.
- D. Accessories: Provide braided water supply lines, slip-joint p-trap, and stainless steel basket strainer.

2.06 SUPPLY STOPS

- A. Description: ASME A112.18.1, quarter-turn full-port brass ball valve.
- B. Operation: Handwheel or T-handle.
- C. Finish: Polished chrome.
- D. End Connections: Provide supply stops with end connections to match rough-in piping.
- E. Maximum Working Pressure: 125 psi (8.6 bar).
- F. Working Temperature Range: 33 to 160 degrees F (0.5 to 71 degrees C).

2.07 UNDER-LAVATORY PIPE SUPPLY COVERS

- A. Manufacturers:
 - 1. Plumberex Specialty Products, Inc: www.plumberex.com/#sle.
 - 2. Truebro: www.ipsplumbingproducts.com/brands/truebro/#sle..
 - 3. Or approved equal.

B. General:

1. Insulate exposed drainage piping including hot, cold and tempered water supplies under lavatories or sinks per ADA Standards.
2. Adhesives, sewing threads and two ply laminated materials are prohibited.
3. Exterior Surfaces: Smooth nonabsorbent with no finger recessed indentations for easy cleaning.
4. Construction: 1/8 inch (3.2 mm) PVC with antimicrobial, antifungal and UV resistant properties.
 - a. Provide one piece injected molded design with internal bridge at top of J-bend to prevent separating.
 - b. Comply with ASTM E84 for flame and smoke development.
 - c. Comply with ASTM C1822 Type III for covers on accessible lavatory piping.
 - d. Comply with ASME A112.18.9 for covers on accessible lavatory piping.
 - e. Comply with ICC A117.1.
 - f. Thermal Resistance: R value of 0.504 or lower when tested by ASTM C177.
 - g. Thermal Conductivity: K value of 0.358 or density of 21.61 pcf per ASTM C518.
 - h. Microbial and Fungal Resistance for Interior and Exterior: Comply with ASTM G21.
5. Color: High gloss white.
6. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces. No cable ties allowed.

2.08 BI-LEVEL, ELECTRIC WATER COOLERS

A. Manufacturers:

1. Elkay Manufacturing Company: www.elkay.com/#sle.
2. Haws Corporation: www.hawesco.com/#sle.
3. Oasis International: www.oasiscoolers.com/#sle.
4. Or approved equal.

B. Water Cooler: Bi-level, electric, mechanically refrigerated; surface mounted, ADA compliant; stainless steel top, stainless steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, push button, mounting bracket; integral air cooled condenser and stainless steel grille.

1. Capacity: 8 gph (30.3 Lph) of 50 degrees F (10 degrees C) water with inlet at 80 degrees F (27 degrees C) and room temperature of 90 degrees F (32 degrees C), when tested in accordance with ASHRAE Std 18.
2. Electrical: 115 VAC, 60 Hertz compressor, 6 foot (2 m) cord and plug for connection to electric wiring system including grounding connector.

C. Bottle Filler: Materials to match fountain.

2.09 MOP SINKS

A. Manufacturers:

1. Acorn Engineering Company: www.acorneng.com/#sle.
2. Fiat Products: www.fiatproducts.com/
3. Just Manufacturing Company: www.justmfg.com/#sle.
4. Or approved equal.

B. Material: Precast terrazzo composed of marble chips cast in Portland cement.

C. Type: Rectilinear, standard height.

D. Grid strainer: Stainless steel; integral; removable.

E. Dimensions: As indicated on drawings.

F. Accessories:

1. 5 feet (1.5 m) of 1/2 inch (13 mm) diameter plain end reinforced rubber hose.
2. Hose clamp hanger.
3. Mop hanger.

4. Stainless steel wall guards.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify walls, floors, and finishes are prepared and ready for installation of fixtures.
- B. Verify rough-ins for field connections match sizes and locations shown on drawings.
- C. Verify electric power is available and of the correct characteristics.
- D. Review casework and countertop shop drawings. Confirm locations and sizes of fixtures and openings before rough-in and installation.
- E. Verify casework and countertops are prepared and ready for installation of fixtures.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install components level and plumb.
- C. Secure fixtures in place.
- D. Install rigid or flexible supplies to fixtures. Provide supply stops, reducers, and escutcheons.
- E. Install wall-mounted fixtures, trim, and accessories at heights indicated on Architectural drawings.
- F. Install new batteries in battery-powered fixtures at time of Date of Substantial Completion.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Repair or replace damaged or defective products.
- D. Test fixtures after installation to verify operation. Correct deficiencies.

3.04 ADJUSTING

- A. Adjust stops and valves so fixtures operate without splashing, noise, or overflow.
- B. Adjust sensor range on sensor-operated fixtures.

3.05 CLEANING

- A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.
- B. Clean plumbing fixtures to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.06 PROTECTION

- A. Protect installed products from damage due to subsequent construction operations.
- B. Do not permit use of fixtures by construction personnel.

END OF SECTION

SECTION 22 4017 BATHTUBS AND SHOWERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Showers.
- B. Bathtub and shower faucets, valves, and trim.

1.02 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ASME A112.18.1 - Plumbing Supply Fittings; 2024.
- C. ASME A112.18.2 - Plumbing Waste Fittings; 2020.
- D. ASSE 1014 - Performance Requirements for Backflow Prevention Devices for Hand-Held Showers; 2020.
- E. ASSE 1016 - Performance Requirements for Automatic Compensating Valves for Individual Showers and Tub/Shower Combinations; 2017 (Reaffirmed 2021).
- F. IAPMO Z124 - Plastic Plumbing Fixtures; 2022, with Editorial Revision.
- G. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- H. NSF 61 - Drinking Water System Components - Health Effects; 2025, with Addendum
- I. NSF 372 - Drinking Water System Components - Lead Content; 2024.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's literature and data sheets for each product. Include materials of fabrication, rough-in requirements, location and sizes of connections, configurations, dimensions, finishes, features, and accessories.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. See Section 01 7419 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.
- C. Keep products in original manufacturer's packaging and protect from damage until ready for installation.
- D. Store products indoors in clean, dry area. Protect from water and dirt. Elevate above floor.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Systems: Provide supply fixtures, fittings, valves, and trim certified as complying with NSF 61 and NSF 372.
- B. ADA: Where indicated to be ADA-compliant, provide fixtures complying with ADA Standards and ICC A117.1.
- C. Maximum Fixture and Faucet Supply Pressure: 80 psi (550 kPa) unless stated otherwise.

2.02 SHOWERS

- A. Manufacturers:
 - 1. American Bath Group: www.americanbathgroup.com/#sle.
 - 2. Best Bath Systems: www.bestbath.com/#sle.
 - 3. Or approved equal.
- B. Acrylic and Fiberglass Showers: IAPMO Z124, molded cast acrylic or reinforced glass fiber with acrylic or gel overlay, with slip-resistant surface.

- C. Style:
 - 1. Single-piece shower.
- D. Shower Reinforcing: Factory-installed partial plywood backing for grab bar placement.
- E. Drains: Provide ASME A112.18.2, NPS 2 (DN 50) drain and p-trap.
 - 1. Drain Finish: Match strainer finish to shower trim.
- F. Accessories:
 - 1. Folding Seat: Factory or field installed to meet ADA Standards and ICC A117.1.
 - 2. Grab Bars: Manufacturer provided in quantity, size, and locations to meet ADA Standards and ICC A117.1.
 - 3. Soap dish.
 - 4. Shower rod.

2.03 BATHTUB AND SHOWER FAUCETS, VALVES, AND TRIM

- A. Hand Showers:
 - 1. Assembly: ASME A112.18.1 with shower wand, wall supply elbow, hose, and ASSE 1014 backflow preventer.
 - 2. Control Valve: ASSE 1016, pressure balancing, brass or bronze body with inlet checkstops; integral volume and temperature control with adjustable high-temperature limit stop.
 - 3. Finish: As indicated on drawings.
 - 4. Hose: Minimum 59-inch (1499 mm) flexible metal hose in finish to match shower wand.
 - 5. Flow Rate: Maximum 2.5 gpm (9.5 L/min) at 80 psi (550 kPa).
 - 6. Hand Shower Mounting:
 - a. Grab Bar: ADA-compliant, 36-inch (914 mm) long grab bar with adjustable slide.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify walls, floors, and finishes are prepared and ready for installation of fixtures.
- B. Verify rough-ins for field connections match sizes and locations shown on drawings.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install products level and plumb.
- C. Secure fixtures in place.
- D. Install wall-mounted fixtures, trim, and accessories at heights indicated on Architectural drawings.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements for additional requirements.
- B. Inspect each product for damage and defects.
- C. Repair or replace damaged or defective products.
- D. Test fixtures after installation to verify operation. Correct deficiencies.

3.04 CLEANING

- A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.
- B. Clean fixtures to remove dirt, fingerprints, paint, and other foreign material. Restore finishes to match original factory finish.

3.05 PROTECTION

- A. Protect installed products from damage due to subsequent construction operations.

- B. Do not permit use of fixtures by construction personnel.

END OF SECTION

BUILDING FOR ROGERS FACILITIES DEPARTMENT
ROGERS, AR

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DEMX ARCHITECTURE
FAYETTEVILLE, AR

**SECTION 22 4500
EMERGENCY PLUMBING FIXTURES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Eye/face wash equipment.
- B. Emergency-fixture water-tempering valves.

1.02 REFERENCE STANDARDS

- A. ANSI Z358.1 - American National Standard for Emergency Eyewash and Shower Equipment; 2014, with Editorial Revision (2020).
- B. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2023.
- C. ASSE 1071 - Performance Requirements for Temperature Actuated Mixing Valves for Plumbed Emergency Equipment; 2012 (Reaffirmed 2021).
- D. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's catalog sheets for fixtures, accessories, and supplies.

PART 2 PRODUCTS

2.01 EYE/FACE WASH EQUIPMENT

- A. Manufacturers:
 - 1. Bradley: www.bradleycorp.com/#sle.
 - 2. Guardian Equipment: www.gesafety.com/#sle.
 - 3. Or approved equal.
- B. ANSI Z358.1, wall-mounted bowl with dual eye-spray head assembly.
- C. Product Certification: UL (DIR).
- D. Thermostatic Mixing Valve: ASSE 1071, manufacturer furnished, sized for flow rate of face wash.
- E. Tepid Supply Water Temperature: Set to 65 degrees F (19 degrees C).
- F. Water Supply Connection Size: 1/2 inch (12.7 mm).
- G. Water Discharge Flow Rate: Minimum, 3 gpm (11.3 Lpm) for 15 minutes.
- H. Pipe and Fittings Material: Epoxy coated galvanized steel.
- I. Valve: Full flow, self closing, quick to open thru wide-handle manual hand operator.
- J. Drain: Built-into the bowl assembly with 1-1/4 inch (3.2 cm) female outlet.
- K. Accessories:
 - 1. Bowl Cover: Valve-operated stainless steel hinged assembly.
 - 2. Signage: ANSI Z535.2, emergency eye/face wash safety equipment.

2.02 EMERGENCY-FIXTURE WATER-TEMPERING VALVES

- A. Manufacturers:
 - 1. Bradley: www.bradleycorp.com/#sle.
 - 2. Guardian Equipment: www.gesafety.com/#sle.
 - 3. Or approved equal.
- B. Tepid Water Temperature: Set to 65 degrees F (19 degrees C).
- C. Capacity: Sized to match selected fixture(s) capacity at 30 psi (2 bar) supply pressure.
- D. Valve Assembly: ASSE 1071, thermostatic mixing valve made of lead-free cast brass body with integral built-in cold water bypass (fail safe), color marked dual-scale outlet temperature

gauge, integral inlet check valve, integral inlet strainer, locking-type regulator, and mounting bracket.

- E. Cabinet: 16 gauge, 0.0598 inch (1.52 mm) stainless steel, recessed-mounted with keyed lock.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that fixtures and accessories are of the correct type and size prior to installation.
- B. Verify that deck, wall and floor finishes are prepared and ready for fixture installation.

3.02 INSTALLATION

- A. Install fixtures and fittings in accordance with the manufacturer's instructions.
- B. Adjust water flow rates to comply with manufacturer's rating of the fixture.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements for additional requirements.
- B. Operational Tests: Upon completion and sterilization of plumbing systems, conduct operating tests to demonstrate satisfactory, functional, and operating efficiency.

3.04 CLEANING

- A. Thoroughly clean plumbing fixtures and equipment.
- B. See Section 01 7419 - Construction Waste Management and Disposal for additional requirements.

3.05 PROTECTION

- A. Protect installed products from damage due to subsequent construction operations.
- B. Repair or replace products damaged before Date of Substantial Completion.

3.06 SCHEDULES

- A. Fixture Heights: Install fixtures to heights above finished floor as indicated.
 - 1. Emergency Eye and Face Wash:
 - a. Standard: 38 inches (965 mm) to receptor rim.

END OF SECTION

**SECTION 23 0513
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General construction and requirements.

1.02 RELATED REQUIREMENTS

- A. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A. NEMA MG 00001 - Motors and Generators; 2024.
- B. NFPA 70 - National Electrical Code; 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 wiring diagrams with electrical characteristics and connection requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 GENERAL CONSTRUCTION AND REQUIREMENTS

- A. Electrical Service: Refer to Section 26 0583 for required electrical characteristics.
- B. 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 00001 limits for insulation class, service factor, and motor enclosure type.
- C. 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.
- D. 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.

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

BUILDING FOR ROGERS FACILITIES DEPARTMENT
ROGERS, AR

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DEMX ARCHITECTURE
FAYETTEVILLE, AR

SECTION 23 0517
SLEEVES AND SLEEVE SEALS FOR HVAC 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; 2024.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.
- B. Provide temporary protective coating on cast iron and steel sleeves if shipped loose.

1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

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. Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.
- C. Pipe Passing Through Mechanical and Laundry Room Floors above Basement:
 - 1. Galvanized steel pipe or black iron pipe with asphalt coating.
 - 2. Connect sleeve with floor plate except in mechanical rooms.
- D. 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 in compliance 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.
- B. Sealing Compounds:

1. Provide packing and sealing compound to fill pipe to sleeve thickness.
 2. Combined packing and seal compound is to match partition fire-resistance hourly rating.
- C. Pipe Sleeve Material:
1. Bearing Walls: Steel, cast iron, or terra-cotta pipe.
 2. Masonry Structures: Sheet metal or fiber.
- D. Wall Sleeve: PVC material with waterstop collar, and nailer end-caps.
- E. Sleeve-Forming Disk: Non-conductive plastic-based material, 3 inch (76.2 mm) thick.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Coordinate all piping penetrations with building manufacturer.
- 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. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- E. Structural Considerations:
1. Do not penetrate building structural members unless indicated.
- F. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
- G. 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.
- H. 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.

3.02 CLEANING

- A. Upon completion of work, clean all parts of the installation.
- B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

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 A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).
- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- 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; 2025.
- D. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2024.
- E. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).
- F. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.
- H. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- I. FM (AG) - FM Approval Guide; Current Edition.
- J. MFMA-4 - Metal Framing Standards Publication; 2004.
- K. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.
- L. UL (DIR) - Online Certifications Directory; Current Edition.
- 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 manufacturer's standard catalog pages and data sheets for channel (strut) framing systems and thermal insulated pipe supports.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Coordinate all support hangers and systems with the building manufacturer (Sprung).
 - 2. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.

3. Provide products listed, classified, and labeled as suitable for the 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 the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
 5. 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.
 2. Accessories: Provide bracket covers, cable basket clips, cable tray clips, clamps, conduit clamps, fire-retarding brackets, j-hooks, protectors, and vibration dampeners.
- C. Hanger Rods:
1. Threaded zinc-plated steel unless otherwise indicated.
- D. Cable Hanging System Kits:
1. Manufacturers:
 - a. Ductmate Industries, Inc: ductmate.com/#sle.
 - b. Gripple, Inc: www.gripple.com/#sle.
 - c. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.
 2. Provide cable-wire in bulk or precut lengths with respective cable hangers as required to hold minimum weight of 120 lb (54.4 kg).
 3. Accessories: Provide brackets, clip or c-clip hangers, covers, and y-hook hangers.
- E. 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).
- F. 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.
- G. Beam Clamps:
1. MSS SP-58 types 19 through 23, 25 or 27 through 30 based on required load.

2. Beam C-Clamp: MSS SP-58 type 23, malleable iron and steel with plain, stainless steel, and zinc finish.
 3. Small or Junior Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish. For inverted usage provide manufacturer listed size(s).
 4. Wide Mouth Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish.
 5. Centerload Beam Clamp with Extension Piece: MSS SP-58 type 30, malleable iron with plain finish.
 6. FM (AG) and UL (DIR) Approved Beam Clamp: MSS SP-58 type 19, plain finish,
 7. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.
 8. 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.
- H. 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).
- I. U-Bolts:
1. MSS SP-58 Type 24, carbon steel u-bolt for pipe support or anchoring.
- J. Pipe Hangers:
1. Clevis Hangers, Adjustable:
 - a. Copper Tube: MSS SP-58 Type 1, epoxy-plated copper.
 - b. Standard-Duty: MSS SP-58 Type 1, zinc-colored, epoxy plated.
- K. 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.
- L. Pipe Shields for Insulated Piping:
1. General Construction and Requirements:
 - a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.
 - b. Shields Material: UV-resistant polypropylene with glass fill.
 - c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch (321 mm).
 - d. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
 - e. Maximum Service Temperature: 178 degrees F (81 degrees C).
 - f. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
- M. 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 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. Coordinate all supports attached to the building with building manufacturer (Sprung).
- 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 or building manufacturer.
- 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 CONTROLS FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Vibration isolation requirements.
- B. Vibration isolators.

1.02 REFERENCE STANDARDS

- A. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.

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 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.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 VIBRATION ISOLATION REQUIREMENTS

- A. 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.
 - 3. Select vibration isolators for outdoor equipment to comply with wind design requirements.
- D. Equipment Isolation: As indicated on drawings.

2.02 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. Open (Unhoused) Spring Isolators:
 - a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) without a housing.
 - b. Bottom Load Plate: Nonskid, molded, elastomeric isolator material or steel with nonskid elastomeric isolator pad with provisions for bolting to supporting structure as required.
 - c. Furnished with integral leveling device for positioning and securing supported equipment.
- 3. Housed Spring Isolators:
 - a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) within a metal housing.
 - b. Furnished with integral elastomeric snubbing elements, nonadjustable type, for limiting equipment movement and preventing metal-to-metal contact between housing elements.
 - c. Bottom Load Plate: Steel with nonskid, elastomeric isolator pad with provisions for bolting to supporting structure as required.
 - d. Furnished with integral leveling device for positioning and securing supported equipment.
- 4. Restrained Spring Isolators, Nonseismic:
 - a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) within a metal housing designed to prevent movement of supported equipment above an adjustable vertical limit stop.
 - b. Bottom Load Plate: Steel with nonskid elastomeric isolator pad with provisions for bolting to supporting structure as required.
 - c. Furnished with integral leveling device for positioning and securing supported equipment.
 - d. Provides constant free and operating height.
- 5. Resilient Material Isolator Hangers, Nonseismic:
 - a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material for the lower hanger rod connection.
- 6. Spring Isolator Hangers, Nonseismic:
 - a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection.
 - b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

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. Spring Isolators:
 - a. Position equipment at operating height; provide temporary blocking as required.
 - b. Lift equipment free of isolators prior to lateral repositioning to avoid damage to isolators.
 - c. Level equipment by adjusting isolators gradually in sequence to raise equipment uniformly such that excessive weight or stress is not placed on any single isolator.
 - 2. Isolator Hangers:
 - a. Use precompressed isolator hangers where required to facilitate installation and prevent damage to equipment utility connection provisions.
 - b. Locate isolator hangers at top of hanger rods in accordance with manufacturer's instructions.
 - 3. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
 - 4. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
 - 5. Adjust isolators to be free of isolation short circuits during normal operation.
 - 6. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect vibration isolation and/or seismic control components for damage and defects.
- C. Vibration Isolation Systems:
 - 1. Verify isolator static deflections.
 - 2. Verify vibration isolation performance during normal operation; investigate sources of isolation short circuits.
- D. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

END OF SECTION

BUILDING FOR ROGERS FACILITIES DEPARTMENT
ROGERS, AR

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DEMX ARCHITECTURE
FAYETTEVILLE, AR

SECTION 23 0553
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Pipe markers.

1.02 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2025.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- C. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A. Air Handling Units: Nameplates.
- B. Fans: Nameplates.
- C. Piping: Pipe markers.
- D. Thermostats: Nameplates.

2.02 NAMEPLATES

- A. Letter Color: White.
- B. Letter Height: 1/4 inch (6 mm).
- C. Background Color: Black.
- D. Plastic: Comply with ASTM D709.

2.03 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.

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 plastic pipe markers in accordance with manufacturer's instructions.

END OF SECTION

BUILDING FOR ROGERS FACILITIES DEPARTMENT
ROGERS, AR

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DEMX ARCHITECTURE
FAYETTEVILLE, AR

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 RELATED REQUIREMENTS

- A. Section 01 4000 - Quality Requirements: Employment of testing agency and payment for services.

1.03 REFERENCE STANDARDS

- A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.
- B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2024, with Errata (2025).
- C. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2023.

1.04 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. Submit to Architect.
 - 2. 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. Identification and types of measurement instruments to be used and their most recent calibration date.
 - d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
 - e. Final test report forms to be used.
 - 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. Submit under provisions of Section 01 4000.
 - 2. Submit to the Architect within two weeks after completion of testing, adjusting, and balancing.
 - 3. Revise TAB plan to reflect actual procedures and submit as part of final report.
 - 4. 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.
 - 5. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
 - 6. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
 - 7. Units of Measure: Report data in I-P (inch-pound) units only.

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. AABC (NSTSB), AABC National Standards for Total System Balance.
 - 2. SMACNA (TAB).
 - 3. Maintain at least one copy of the standard to be used at project site at all times.
- 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. Having minimum of three years documented experience.
 - 3. 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. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - 3. Duct systems are clean of debris.
 - 4. Fans are rotating correctly.
 - 5. Fire and volume dampers are in place and open.
 - 6. Access doors are closed and duct end caps are in place.
 - 7. Air outlets are installed and connected.
 - 8. Duct system leakage is minimized.
- B. Beginning of work means acceptance of existing conditions.

3.03 PREPARATION

- A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect to facilitate spot checks during testing.

3.04 ADJUSTMENT TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 5 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 5 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 5 percent of design.

3.05 RECORDING AND ADJUSTING

- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.06 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. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. 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.
- F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- G. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

3.07 SCOPE

- A. Test, adjust, and balance the following:
 - 1. Air Handling Units.
 - 2. Fans.
 - 3. Air Inlets and Outlets.

3.08 MINIMUM DATA TO BE REPORTED

- A. Electric Motors:
 - 1. Manufacturer.
 - 2. Model/Frame.
 - 3. HP/BHP.
 - 4. Phase, voltage, amperage; nameplate, actual, no load.
 - 5. RPM.
 - 6. Service factor.
- B. Air Handling Equipment:
 - 1. Manufacturer.
 - 2. Model number.
 - 3. Serial number.
 - 4. Supply air flow, specified and actual.
 - 5. Return air flow, specified and actual.
 - 6. Outside air flow, specified and actual.
 - 7. Total static pressure (total external), specified and actual.
 - 8. Discharge temperature for cooling and heating.
 - 9. Fan RPM.
- C. Exhaust Fans:
 - 1. Manufacturer.
 - 2. Model number.
 - 3. Serial number.
 - 4. Air flow, specified and actual.
 - 5. Total static pressure (total external), specified and actual.
 - 6. Fan RPM.
- D. Duct Traverses:
 - 1. System zone/branch.

2. Duct size.
3. Area.
4. Design velocity.
5. Design air flow.
6. Test velocity.
7. Test air flow.
8. Duct static pressure.

END OF SECTION

SECTION 23 0713 DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Duct insulation.
- B. 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 C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2024.
- D. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2025.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.
- F. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- G. 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.

1.05 FIELD CONDITIONS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period 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, FLEXIBLE

- A. Manufacturer:
 - 1. CertainTeed Corporation: www.certainteed.com/#sle.
 - 2. Johns Manville: www.jm.com/#sle.
 - 3. Knauf Insulation; Performance+ Duct Wrap: www.knaufinsulation.com/#sle.
 - 4. Owens Corning Corporation; SOFTR Duct Wrap FRK: www.owenscorning.com/en-us/#sle.

- 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: 250 degrees F (121 degrees C).
 - 3. Maximum Water Vapor Absorption: 5.0 percent by weight.
- C. Vapor Barrier Jacket:
 - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
 - 2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/(Pa s m)), when tested in accordance with ASTM E96/E96M.
 - 3. Secure with pressure-sensitive tape.
- D. Vapor Barrier Tape:
 - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.
- E. Indoor Vapor Barrier Mastic:

2.03 GLASS FIBER, RIGID

- A. Manufacturer:
 - 1. CertainTeed Corporation: www.certainteed.com/#sle.
 - 2. Johns Manville: www.jm.com/#sle.
 - 3. Knauf Insulation; Earthwool Insulation Board: www.knaufinsulation.com/#sle.
 - 4. Owens Corning Corporation; 700 Series FIBERGLAS Insulation: www.owenscorning.com/en-us/#sle.
- B. Insulation: ASTM C612; rigid, noncombustible.
 - 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).
 - 3. Maximum Water Vapor Absorption: 5.0 percent.
 - 4. Maximum Density: 8.0 pcf (128 kg/cu m).
- C. Vapor Barrier Jacket:
 - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
 - 2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/(Pa s m)), when tested in accordance with ASTM E96/E96M.
 - 3. Secure with pressure-sensitive tape.
- D. Vapor Barrier Tape:
 - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.
- E. Indoor Vapor Barrier Finish:
 - 1. Vinyl emulsion type acrylic, compatible with insulation, black color.

2.04 JACKETING AND ACCESSORIES

- A. Aluminum Jacket:
 - 1. Provide aluminum embossed jacketing for all externally insulated metal ductwork exterior to the building.
 - 2. 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.
 - 3. Thickness: 0.016 inch (0.40 mm) sheet.
 - 4. Finish: Embossed.
 - 5. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
 - 6. Fittings: 0.016 inch (0.40 mm) thick die-shaped fitting covers with factory-attached protective liner.
 - 7. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.015 inch (0.38 mm) thick aluminum.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. 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.
- C. Slope exterior ductwork to shed water.
- D. 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. Provide embossed aluminum jacketing over all exposed external duct insulation.

END OF SECTION

BUILDING FOR ROGERS FACILITIES DEPARTMENT
ROGERS, AR

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DEMX ARCHITECTURE
FAYETTEVILLE, AR

**SECTION 23 0719
HVAC PIPING INSULATION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping insulation.
- B. Flexible removable and reusable blanket insulation.
- C. Jacketing and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.

1.03 REFERENCE STANDARDS

- A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- B. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2025.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.
- D. 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.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.06 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 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- A. Manufacturers:
 - 1. Aeroflex USA; AEROFLEX Self-Seal: www.aeroflexusa.com/#sle.
 - 2. Armacell LLC; AP ArmaFlex: www.armacell.us/#sle.
- B. 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: 180 degrees F (82 degrees C).
 - 3. Connection: Waterproof vapor barrier adhesive.
- C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.03 JACKETING AND ACCESSORIES

- A. 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. Type: Factory-applied, self-adhesive jacketing.
4. Finish: Embossed.
5. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
6. Fittings: 0.016 inch (0.40 mm) thick die-shaped fitting covers with factory-attached protective liner.
7. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.015 inch (0.38 mm) thick aluminum.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Exposed Piping: Locate insulation and cover seams in least visible locations.
- C. Insulated Pipes Conveying Fluids Below Ambient Temperature:
 1. Insulate entire system, including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- D. Inserts and Shields:
 1. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
- E. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 07 8400.
- F. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping. Provide two coats of UV-resistant finish for flexible elastomeric cellular insulation without jacketing.

END OF SECTION

SECTION 23 2113 HYDRONIC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hydronic system requirements.
- B. Equipment drains and overflows.
- C. Pipe hangers and supports.
- D. Unions, flanges, mechanical couplings, and dielectric connections.

1.02 RELATED REQUIREMENTS

- A. Section 23 0516 - Expansion Fittings and Loops for HVAC Piping.
- B. Section 23 2500 - HVAC Water Treatment: Pipe cleaning.

1.03 REFERENCE STANDARDS

- A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
- B. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
- C. ASME B31.9 - Building Services Piping; 2025.
- D. ASTM B32 - Standard Specification for Solder Metal; 2020.
- E. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.
- F. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.
- G. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2021a.
- H. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2025a.
- I. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2024.
- J. ASTM D2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80; 2024.
- K. 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 (Reapproved 2024).
- L. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 2024.
- M. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.

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 manufacturers catalog information.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- B. 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 HYDRONIC SYSTEM REQUIREMENTS

- A. Comply with ASME B31.9 and applicable federal, state, and local regulations.
- B. Piping: Provide piping, fittings, hangers, and supports as required, as indicated, and as follows:
 - 1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
 - 2. Use non-conducting dielectric connections whenever jointing dissimilar metals.
 - 3. Grooved mechanical joints are not permitted in any location.
 - 4. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.
- C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges or unions to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.

2.02 EQUIPMENT DRAINS AND OVERFLOWS

- A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), drawn; using one of the following joint types:
 - 1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings; ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
- B. PVC Pipe: ASTM D1785, Schedule 40, or ASTM D2241, SDR 21 or 26.
 - 1. Fittings: ASTM D2466 or D2467, PVC.
 - 2. Joints: Solvent welded in accordance with ASTM D2855.
 - 3. Insulation not required for PVC piping.

2.03 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. Hangers for Pipe Sizes 1/2 to 1-1/2 Inches (13 to 38 mm): Malleable iron, adjustable swivel, split ring.
 - 3. Hangers for Cold Pipe Sizes 2 Inches (50 mm) and Greater: Carbon steel, adjustable, clevis.

2.04 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

- A. Unions for Pipe of 2 Inches (50 mm, DN) and Less:
- B. Flanges for Pipe 2 Inches (50 mm, DN) and Greater:

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment using jointing system specified.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.
- E. After completion, fill, clean, and treat systems. See Section 23 2500 for additional requirements.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- C. Route piping in orderly manner, parallel to building structure, and maintain gradient.

- D. Install piping to conserve building space and to avoid interference with use of space.
- E. Group piping whenever practical at common elevations.
- F. Sleeve pipe passing through partitions, walls, and floors.
- G. Slope piping and arrange to drain at low points.
- H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. See Section 23 0516.
- I. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9, ASTM F708, or MSS SP-58.

END OF SECTION

BUILDING FOR ROGERS FACILITIES DEPARTMENT
ROGERS, AR

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DEMX ARCHITECTURE
FAYETTEVILLE, AR

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. Engineered wall seals and insulation protection.
- H. 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 15 - Safety Standard for Refrigeration Systems; 2024, with Addendum (2026).
- D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
- E. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; 2022.
- F. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2023.
- G. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.
- H. IAPMO (UMC) - 2024 Uniform Mechanical Code; 2024.
- I. ICC (IMC) - International Mechanical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.
- K. 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 general assembly of specialties, including manufacturers catalogue information. Provide manufacturers catalog data including load capacity.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store piping and specialties in shipping containers with labeling in place.
- B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.
- C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

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. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.
- C. 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.
 - 3. Mechanical Press Fittings: UL 207 listed, ICC (IMC) and IAPMO (UMC) approved, with HNBR seals.
- B. Pipe Supports and Anchors:
 - 1. Provide hangers and supports complying 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. Vertical Support: Steel riser clamp.
 - 7. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
 - 8. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
 - 9. 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.

2.04 REFRIGERANT

- A. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) no greater than that allowed by federal code.

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. Diaphragm Packless Valves:
 - 1. UL listed, globe or angle pattern, forged brass body and bonnet, phosphor bronze and stainless steel diaphragms, rising stem and handwheel, stainless steel spring, nylon seat disc, soldered or flared ends, with positive backseating; for maximum working pressure of 500 psi (3450 kPa) and maximum temperature of 275 degrees F (135 degrees C).
- B. 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).

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 ENGINEERED WALL SEALS AND INSULATION PROTECTION

A. Basis of Design: Airex Manufacturing, Inc; www.airexmfg.com/#sle.

1. Pipe Penetration Wall Seal: Airex Titan Outlet.
2. Pipe Penetration Wall Seal: Seals HVAC piping wall penetrations with compression gasket wall mounted rigid plastic outlet cover.
 - a. Outlet Cover Color: Gray.
3. Insulation Protection System: Mechanical line insulation and PVC cover.
 - a. PVC Insulation Cover Color: Black with full-length velcro fastener.

2.10 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.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.02 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. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.

- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.5.
- G. Where pipe support members are welded to structural building frame, brush clean, and apply one coat of zinc rich primer to welding.
- H. Insulate piping _____.
- I. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.
- J. Fully charge completed system with refrigerant after testing.

END OF SECTION

SECTION 23 3100 HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal ducts.
- B. Flexible ducts.

1.02 RELATED REQUIREMENTS

- A. Section 23 0130.51 - HVAC Air-Distribution System Cleaning: Post install duct cleaning.

1.03 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.
- B. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- C. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.
- D. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.
- E. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; 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 and duct connections.

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, and approved by manufacturer.
- B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of documented experience.

1.06 FIELD CONDITIONS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

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. be substituted at the Contractor's option.
- C. Duct Shape and Material in accordance with Allowed Static Pressure Range:
 - 1. Refer to drawings.
- D. Duct Sealing and Leakage in accordance with Static Pressure Class:
 - 1. Refer to drawings.
- E. 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 Single Wall: Rectangular, longitudinal lock seam duct with galvanized steel wall.
- C. 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: 2" thick.
 - 2) Material: Fiberglass.
 3. Round Connection System: Interlocking duct connection system in accordance with SMACNA (DCS).
- D. Round Spiral Duct:
 1. Round spiral lock seam duct with galvanized steel outer wall.
- E. Connectors, Fittings, Sealants, and Miscellaneous:
 1. Fittings: Manufacture with solid inner wall of perforated galvanized steel.

2.03 FLEXIBLE DUCTS

- A. Flexible Ducts: UL 181, Class 1, polyethylene film, mechanically fastened and rolled using galvanized steel to form 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).

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. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering the ductwork system.

- E. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- F. Duct sizes indicated are precise inside dimensions.
- G. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- H. At exterior wall louvers, seal duct to louver frame and install blank-out panels.

3.02 CLEANING

- A. Clean thoroughly each duct system. See Section 23 0130.51.

END OF SECTION

BUILDING FOR ROGERS FACILITIES DEPARTMENT
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**SECTION 23 3300
AIR DUCT ACCESSORIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Backdraft dampers - metal.
- B. Flexible duct connectors.
- C. Volume control dampers.

1.02 RELATED REQUIREMENTS

- A. Section 23 3100 - HVAC Ducts and Casings.

1.03 REFERENCE STANDARDS

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

1.04 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.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect dampers from damage to operating linkages and blades.

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 FLEXIBLE DUCT CONNECTORS

- A. Manufacturers:
 - 1. Carlisle HVAC Products; Dynair Connector Plus G90 Steel Offset Seam Neoprene Fabric: www.carlislehvac.com/#sle.
 - 2. Ductmate Industries, Inc, a DMI Company; ____: www.ductmate.com/#sle.
- B. Fabricate in accordance with SMACNA (DCS) and as indicated.
- C. Flexible Duct Connections: Fabric crimped into metal edging strip.

2.03 VOLUME CONTROL DAMPERS

- A. Fabricate in accordance with SMACNA (DCS) and as indicated.
- 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.
 - 1. Blade: 18 gauge, 0.0478 inch (1.21 mm), minimum.
- 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.

PART 3 EXECUTION

3.01 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. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
- D. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.
- E. 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 3423
HVAC POWER VENTILATORS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cabinet exhaust fans.
- B. Inline centrifugal fans and blowers.

1.02 RELATED REQUIREMENTS

- A. Section 23 0548 - Vibration Controls for HVAC.
- B. Section 23 3300 - Air Duct Accessories: Backdraft dampers.

1.03 REFERENCE STANDARDS

- A. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.
- B. AMCA 99 - Standards Handbook; 2025.
- C. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2020.
- D. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2025.
- E. AMCA 300 - Reverberation Room Methods of Sound Testing of Fans; 2024.
- F. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2022.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on fans and accessories, including fan curves with specified operating point plotted, power, rpm, sound power levels at rated capacity, and electrical characteristics and connection requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Greenheck Fan Corporation: www.greenheck.com/#sle.
- B. Loren Cook Company: www.lorencook.com/#sle.
- C. Twin City Fan & Blower: www.tcf.com/#sle.

2.02 POWER VENTILATORS - GENERAL

- A. Static and Dynamically Balanced: Comply with AMCA 204.
- B. Performance Ratings: Comply with AMCA 210, bearing certified rating seal.
- C. Sound Ratings: Comply with AMCA 301, tested to AMCA 300, bearing certified sound ratings seal.
- D. Fabrication: Comply with AMCA 99.
- E. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.03 CABINET EXHAUST FANS

- A. Centrifugal Fan Unit: Direct driven with galvanized steel housing lined with acoustic insulation, resiliently mounted motor, gravity backdraft damper in discharge.
- B. Grille: Aluminum with baked white enamel finish.
- C. Performance Ratings: As indicated on drawings.

2.04 INLINE CENTRIFUGAL FANS AND BLOWERS

- A. Centrifugal Fan Unit: Direct driven, with galvanized steel housing lined with acoustic insulation, resiliently-mounted motor, gravity backdraft damper in discharge.
- B. Performance Ratings: As indicated on drawings.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Hung Cabinet Fans:
 - 1. Install fans with resilient mountings and flexible electrical leads, see Section 23 0548.
 - 2. Install flexible connections between fan and ductwork; see Section 23 3300. Ensure metal bands of connectors are parallel with minimum 1 inch (25 mm) flex between ductwork and fan while running.
- C. Provide backdraft dampers on outlet from cabinet and ceiling exhausters fans and as indicated.

END OF SECTION

SECTION 23 7416
PACKAGED ROOFTOP AIR-CONDITIONING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Packaged, intermediate-capacity, rooftop air-conditioning units.

1.02 RELATED REQUIREMENTS

- A. Section 23 0548 - Vibration Controls for HVAC.

1.03 REFERENCE STANDARDS

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.
- D. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.
- E. 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 Filters: One set for each unit.

1.05 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.

1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Provide a five year warranty to include coverage for refrigeration compressors.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Daikin.
- B. Johnson Controls International, PLC: www.johnsoncontrols.com/#sle.
- C. Lennox.
- D. Trane Technologies, PLC: www.trane.com/#sle.

2.02 PACKAGED, INTERMEDIATE-CAPACITY, ROOFTOP AIR-CONDITIONING UNITS

- A. General: Roof mounted or ground mounted units having gas burner and electric refrigeration that are 6.0 tons to 25 tons in capacity.
- B. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply 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) no greater than that allowed by federal code.

2.03 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: One-inch (25 mm) thick, neoprene-coated glass fiber with edges protected from erosion.

2.04 FANS

- A. Supply Fan: Forward curved centrifugal type, resiliently mounted with direct drive, and rubber isolated hinge mounted. Provide with high efficiency motor. Isolate complete fan assembly. See Section 23 0548.

2.05 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.

2.06 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.

2.07 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.

2.08 HEAT RECOVERY COIL

- A. Provide copper tube aluminum fin coil assembly arranged to provide heat recovery.

2.09 COMPRESSORS

- A. Provide scroll 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. 2-inch (50 mm) thick, MERV 8, glass fiber disposable media in metal frames.

2.11 ROOF CURBS

- A. Refer to equipment schedules.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Mount units on factory built plenum mounting curb (where scheduled) providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level.

3.02 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. Forced air furnaces.
- B. Air cooled condensing units.
- C. Indoor air handling (fan and coil) units for ducted systems.
- D. 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; 2026.
- B. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.
- C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2024, with Addendum (2026).
- D. ASHRAE Std 23 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Compressor Units; 2022.
- E. NEMA MG 00001 - Motors and Generators; 2024.
- F. NFPA 54 - National Fuel Gas Code; 2024.
- G. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- H. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.
- I. NFPA 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances; 2024.
- J. 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.
- C. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.
- D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- E. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.05 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Daikin.
- B. Lennox.

- C. Trane Technologies, PLC: www.trane.com/#sle.
- D. Johnson Controls International.

2.02 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. Heating: Natural gas fired.
 - 2. Cooling: Outdoor electric condensing unit with evaporator coil in central ducted indoor unit.
 - 3. 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. _____ kW.
 - 2. _____ volts, single phase, 60 Hz.
 - 3. _____ amperes maximum fuse size.
 - 4. Disconnect Switch: Factory mount disconnect switch on equipment under provisions of Section 26 0583.

2.03 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 glass fiber, disposable 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.

2.04 OUTDOOR UNITS

- A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
 - 1. Comply with AHRI 210/240.
 - 2. Refrigerant: R-454B.
 - 3. Cabinet: Galvanized steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
 - 4. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23 and UL 207.
- B. Air Cooled Condenser: Aluminum fin and copper tube coil, AHRI 520 with direct drive axial propeller fan resiliently mounted, galvanized fan guard.
 - 1. Condenser Fans: Direct-drive propeller type.
- C. 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.

- D. Operating Controls:
 - 1. Control by room thermostat to maintain room temperature setting.

2.05 GAS FURNACE COMPONENTS

- A. Burner: Atmospheric type with adjustable combustion air supply,
 - 1. Gas valve, two stage provides 100 percent safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (On-Off), pilot filtration, automatic electric valve.
 - 2. Combustion air damper with synchronous spring return damper motor.
 - 3. Non-corrosive combustion air blower with permanently lubricated motor.
- B. Burner Safety Controls:
 - 1. Thermocouple Sensor: Prevents opening of gas valve until pilot flame is proven and stops gas flow on ignition failure.
 - 2. Flame Rollout Switch: Installed on burner box and prevents operation.
 - 3. Vent Safety Shutoff Sensor: Temperature sensor installed on draft hood and prevents operation, manual reset.
 - 4. Limit Control: Fixed stop at maximum permissible setting, de-energizes burner on excessive bonnet temperature, automatic resets.
- C. Operating Controls:
 - 1. Cycle burner by room thermostat to maintain room temperature setting.
 - 2. Supply fan energized from bonnet temperature independent of burner controls, with adjustable timed off delay and fixed timed on delay, with manual switch for continuous fan operation.

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.
- C. Install gas fired furnaces in accordance with NFPA 54.
- D. Provide vent connections in accordance with NFPA 211.
- E. Install refrigeration systems in accordance with ASHRAE Std 15.

END OF SECTION

BUILDING FOR ROGERS FACILITIES DEPARTMENT
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DEMX ARCHITECTURE
FAYETTEVILLE, AR

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. Heat shrink tubing.
- F. Oxide inhibiting compound.
- G. Wire pulling lubricant.
- H. Cable ties.
- I. Firestop sleeves.

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 26 0526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

1.03 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2024).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2023.
- 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 (Reapproved 2023).
- G. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2024.
- H. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2020.
- I. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- J. NECA 104 - Standard for Installing Aluminum Building Wire and Cable; 2012.
- K. NECA 120 - Standard for Installing Armored Cable (AC) and Type Metal-Clad (MC) Cable; 2018.
- L. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.
- M. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
- N. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- O. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

- P. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- Q. UL 267 - Outline of Investigation for Wire-Pulling Compounds; Current Edition, Including All Revisions.
- R. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- S. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
- T. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.
- U. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.
- V. 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.

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.

1.08 FIELD CONDITIONS

- A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F (-10 degrees C), unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

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.
- C. Nonmetallic-sheathed cable is not permitted.
- D. Underground feeder and branch-circuit cable is not permitted.
- E. Service entrance cable is not permitted.
- F. Armored cable is not permitted.
- G. Metal-clad cable is permitted only as follows:
 - 1. Where not otherwise restricted, may be used:

- a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
 - 1) Maximum Length: 6 feet (1.8 m).
- b. Where concealed in hollow stud walls and above accessible ceilings for branch circuits up to 20 A.
 - 1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.
- 2. In addition to other applicable restrictions, may not be used:
 - a. Unless approved by Owner.
 - b. Where not approved for use by the authority having jurisdiction.
 - c. Where exposed to view.
 - d. Where exposed to damage.
 - e. For damp, wet, or corrosive locations, unless provided with a PVC jacket listed as suitable for those locations.

H. Manufactured wiring systems are not permitted.

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. 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) Provide aluminum equipment grounding conductor sized according to NFPA 70.
 - 4) 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.
- I. 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.
- J. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- 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. 208Y/120 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - 4) Neutral/Grounded: White.
 - b. Equipment Ground, All Systems: Green.

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: Solid.
 - 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.
 - a. Size 4 AWG and Larger: Type XHHW-2.
 - b. Installed Underground: Type XHHW-2.

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. Grounding: Full-size integral equipment grounding conductor.
- F. Armor: Steel, interlocked tape.
- G. Provide PVC jacket applied over cable armor.

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.
- C. Wiring Connectors for Splices and Taps:
 - 1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.

2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
 3. Connectors for Aluminum Conductors: Use compression connectors.
- D. Wiring Connectors for Terminations:
1. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
 2. Aluminum Conductors: Use compression connectors for all connections.
 3. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
- E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.
- G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F (105 degrees C) for standard applications and 302 degrees F (150 degrees C) for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
- H. Mechanical Connectors: Provide bolted type or set-screw type.
- I. Compression Connectors: Provide circumferential type or hex type crimp configuration.
- J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

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).
 3. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil (0.76 mm); suitable for continuous temperature environment up to 194 degrees F (90 degrees C) and short-term 266 degrees F (130 degrees C) overload service.
 4. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil (3.2 mm); suitable for continuous temperature environment up to 176 degrees F (80 degrees C).
 5. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil (2.3 mm).
- B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
- C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
- D. 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.
- E. Cable Ties: Material and tensile strength rating suitable for application.
- F. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that field measurements are as indicated.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

- A. Circuiting Requirements:
 - 1. Unless dimensioned, circuit routing indicated is diagrammatic.
 - 2. When circuit destination is indicated without specific routing, determine exact routing required.
 - 3. Arrange circuiting to minimize splices.
 - 4. Include circuit lengths required to install connected devices within 10 ft (3.0 m) of location indicated.
 - 5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
 - 6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
 - 7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
 - 8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
- B. Install products in accordance with manufacturer's instructions.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Install aluminum conductors in accordance with NECA 104.
- E. Install metal-clad cable (Type MC) in accordance with NECA 120.
- F. 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.
- G. Exposed Cable Installation (only where specifically permitted):
 - 1. Route cables parallel or perpendicular to building structural members and surfaces.
 - 2. Protect cables from physical damage.
- H. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- I. 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.

1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
 2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.
- J. 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.
- K. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.
- L. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- M. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- N. 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.
 6. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 7. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- O. 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.
1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
 2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
 - b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
- P. Insulate ends of spare conductors using vinyl insulating electrical tape.
- Q. 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.
- R. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

- S. 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.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
 - 1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing.
Replace SPDs damaged by performing high potential testing with SPDs connected.
- D. Correct deficiencies and replace damaged or defective conductors and cables.

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.

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; 2023.
- C. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
- 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. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
 - 3. 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 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

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.
 - 3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.
- 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. Concrete-Encased Electrode:
 - a. Provide connection to concrete-encased electrode consisting of not less than 20 feet (6.0 m) of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
 - 5. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
- 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. 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:

H. 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.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that field measurements are as indicated.
- 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. Perform work in accordance with NECA 1 (general workmanship).
- C. 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.
- D. Identify grounding and bonding system components in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.13.
- D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

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 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 05 5000 - Metal Fabrications: Materials and requirements for fabricated metal supports.
- C. Section 26 0533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- D. Section 26 0533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.
- E. Section 26 5100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- 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. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2022.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.
- F. MFMA-4 - Metal Framing Standards Publication; 2004.
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
 - 2. Coordinate work to provide additional framing and materials required for installation.
 - 3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
 - 4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
 - 5. Notify Architect of 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 cured; see 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 channel/strut framing systems, nonpenetrating rooftop supports, and post-installed concrete/masonry anchors.
 - 1. Fiberglass Channel/Strut Framing Systems: Include requirements for strength derating according to ambient temperature.

1.06 QUALITY ASSURANCE

- A. Maintain at project site one copy of each referenced document that prescribes execution requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

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. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
 - 7. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
 - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
 - c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Materials for Metal Fabricated Supports: See Section 05 5000.
- C. 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.
- D. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.
- E. 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.
- F. Fiberglass Channel/Strut Framing Systems:

1. Description: Factory-fabricated, continuous-slot, fiberglass channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
 2. Flammability: Fire retardant with NFPA 101, Class A flame spread index, maximum of 25, when tested in accordance with ASTM E84; self extinguishing in accordance with ASTM D635.
- G. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.
- H. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for 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. Install hangers and supports in accordance with NECA 1.
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- 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. Conduit Support and Attachment: See Section 26 0533.13 for additional requirements.
- I. Box Support and Attachment: See Section 26 0533.16 for additional requirements.
- J. Interior Luminaire Support and Attachment: See Section 26 5100 for additional requirements.
- K. Secure fasteners in accordance with manufacturer's recommended torque settings.
- L. Remove temporary supports.
- M. Identify independent electrical component support wires above accessible ceilings, where permitted, with color distinguishable from ceiling support wires in accordance with NFPA 70.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

- D. Correct deficiencies and replace damaged or defective support and attachment components.

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. Stainless steel rigid metal conduit (RMC).
- C. Aluminum rigid metal conduit (RMC).
- D. Galvanized steel intermediate metal conduit (IMC).
- E. Stainless steel intermediate metal conduit (IMC).
- F. PVC-coated galvanized steel rigid metal conduit (RMC).
- G. Flexible metal conduit (FMC).
- H. Liquidtight flexible metal conduit (LFMC).
- I. Galvanized steel electrical metallic tubing (EMT).
- J. Stainless steel electrical metallic tubing (EMT).
- K. Aluminum electrical metallic tubing (EMT).
- L. Rigid polyvinyl chloride (PVC) conduit.
- M. Electrical nonmetallic tubing (ENT).
- N. Liquidtight flexible nonmetallic conduit (LFNC).
- O. Reinforced thermosetting resin conduit (RTRC).

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 - Excavation.
- H. Section 31 2323 - Fill: 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 C80.5 - American National Standard for Electrical Rigid Metal Conduit - Aluminum (ERMC-A); 2025.
- D. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit; 2018.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- F. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.
- G. NECA 102 - Standard for Installing Aluminum Rigid Metal Conduit; 2004.
- H. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2025.
- I. NEMA BI 50058 - Electrical Nonmetallic Tubing (ENT); 2014 (Reaffirmed 2019).

- J. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- K. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Metal Conduit and Intermediate Metal Conduit; 2018.
- L. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.
- M. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.
- N. NEMA TC 14 (SERIES) - Reinforced Thermosetting Resin Conduit and Fittings Series; 2015.
- O. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- P. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
- Q. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- R. UL 6A - Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel; Current Edition, Including All Revisions.
- S. UL 360 - Liquid-Tight Flexible Metal Conduit; Current Edition, Including All Revisions.
- T. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.
- U. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- V. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
- W. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
- X. UL 797A - Electrical Metallic Tubing - Aluminum and Stainless Steel; Current Edition, Including All Revisions.
- Y. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.
- Z. UL 1653 - Electrical Nonmetallic Tubing; Current Edition, Including All Revisions.
- AA. UL 1660 - Liquid-Tight Flexible Nonmetallic Conduit; Current Edition, Including All Revisions.
- BB. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; 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.

1.06 QUALITY ASSURANCE

- A. Documents at Project Site: Maintain at project site one copy of manufacturer's instructions and shop drawings.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

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. Under Slab on Grade: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
 - 2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
 - 3. 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.
 - 4. Where rigid polyvinyl (PVC) conduit larger than 2-inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit (RMC) elbows, stainless steel rigid metal conduit (RMC) elbows, galvanized steel intermediate metal conduit (IMC) elbows, stainless steel intermediate metal conduit (IMC) elbows, PVC-coated galvanized steel rigid metal conduit (RMC) elbows, or concrete-encased PVC elbows for bends.
- D. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- E. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- F. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- G. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

- H. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- I. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- J. Exposed, Exterior, Not Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- K. 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).
- L. Flexible Connections to Vibrating Equipment:
 - 1. Dry Locations: Use flexible metal conduit (FMC).
 - 2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit (LFMC).
 - 3. Maximum Length: 6 feet (1.8 m) unless otherwise indicated.

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.
 - 4. Flexible Connections to Luminaires: 3/8-inch (12 mm) trade size.
 - 5. Underground, Interior: 3/4-inch (21 mm) trade size.
 - 6. Underground, Exterior: 1-inch (27 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 STAINLESS STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC stainless steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6A.
- B. Fittings:

1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6A.
2. Material: Use stainless steel with corrosion resistance equivalent to conduit.
3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.05 ALUMINUM RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC aluminum rigid metal conduit complying with ANSI C80.5 and listed and labeled as complying with UL 6A.
- B. Fittings:
 1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6A.
 2. Material: Use aluminum.
 3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.06 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.

2.07 STAINLESS 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.

2.08 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.
- B. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil, 0.040 inch (1.02 mm).
- C. PVC-Coated Boxes and Fittings:
 1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
 2. Nonhazardous Locations: Use boxes and fittings listed and labeled as complying with UL 514A, UL 514B, or UL 6.
 3. Material: Use steel or malleable iron.
 4. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil, 0.040 inch (1.02 mm).
- D. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil, 0.015 inch (0.38 mm).

2.09 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.

2.10 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.

2.11 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.

2.12 STAINLESS STEEL ELECTRICAL METALLIC TUBING (EMT)

- A. Description: NFPA 70, Type EMT stainless steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797A.
- B. Fittings:
 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 2. Connectors and Couplings: Use compression/gland or set-screw type.

2.13 ALUMINUM ELECTRICAL METALLIC TUBING (EMT)

- A. Description: NFPA 70, Type EMT aluminum electrical metallic tubing listed and labeled as complying with UL 797A.
- B. Fittings:
 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; listed for use with aluminum EMT.
 2. Material: Use aluminum.
 3. Connectors and Couplings: Use compression/gland or set-screw type.
 - a. Do not use indenter type connectors and couplings.

2.14 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.

2.15 ELECTRICAL NONMETALLIC TUBING (ENT)

- A. Description: NFPA 70, Type ENT electrical nonmetallic tubing complying with NEMA BI 50058 and listed and labeled as complying with UL 1653.
- B. Fittings:
 1. Manufacturer: Same as manufacturer of ENT to be connected.
 2. Use solvent-welded type fittings.

3. Solvent-Welded Fittings: Rigid PVC fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; suitable for use with ENT.

2.16 LIQUIDTIGHT FLEXIBLE NONMETALLIC CONDUIT (LFNC)

- A. Description: NFPA 70, Type LFNC liquidtight flexible nonmetallic conduit listed and labeled as complying with UL 1660.
- B. Fittings:
 1. Manufacturer: Same as manufacturer of conduit to be connected.
 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; suitable for type of conduit to be connected.

2.17 REINFORCED THERMOSETTING RESIN CONDUIT (RTRC)

- A. Description: NFPA 70, Type RTRC reinforced thermosetting resin conduit complying with NEMA TC 14 (SERIES).
- B. Supports: As recommended by manufacturer.
- C. Fittings: Same type and manufacturer as conduit to be connected.

2.18 ACCESSORIES

- A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil, 0.020 inch (0.51 mm).
- B. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.
- C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- D. Epoxy Adhesive for RTRC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- E. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf (5.6 kN).
- F. Foam Conduit Sealant:
 1. Removable, two-part, closed-cell foam, specifically designed for sealing conduit openings against water, moisture, gases, and dust.
 2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
 3. Rated to hold minimum of 10 ft (3.0 m) water head pressure.
- G. Conduit Mechanical Seals:
 1. Listed as complying with UL 514B.
 2. Specifically designed for sealing conduit openings against water, moisture, gases, and dust.
 3. Suitable for sealing around conductors/cables to be installed.
- H. Sealing Systems for Concrete Penetrations:
 1. Sleeves: Provide water stop ring or cement coating that bonds to concrete to prevent water infiltration.
 2. Rate for minimum of 40 psig; suitable for sealing around conduits to be installed.
- I. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install conduit in accordance with NECA 1.
- C. Galvanized Steel Rigid Metal Conduit (RMC): Install in accordance with NECA 101.
- D. Aluminum Rigid Metal Conduit (RMC): Install in accordance with NECA 102.

- E. Intermediate Metal Conduit (IMC): Install in accordance with NECA 101.
- F. PVC-Coated Galvanized Steel Rigid Metal Conduit (RMC): Install using only tools approved by manufacturer.
- G. Rigid Polyvinyl Chloride (PVC) Conduit: Install in accordance with NECA 111.
- H. Electrical Nonmetallic Tubing (ENT): Install in accordance with NECA 111.
- I. Liquidtight Flexible Nonmetallic Conduit (LFNC): Install in accordance with NECA 111.
- J. 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. Conduits in the following areas may be exposed, unless otherwise indicated:
 - a. Electrical rooms.
 - b. Mechanical equipment rooms.
 - c. Within joists in areas with no ceiling.
 - 5. Unless otherwise approved, do not route exposed conduits:
 - a. Across floors.
 - b. Across roofs.
 - c. Across building exterior surfaces.
 - 6. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
 - 7. Arrange conduit to maintain adequate headroom, clearances, and access.
 - 8. Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.
 - 9. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
 - 10. Route conduits above water and drain piping where possible.
 - 11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
 - 12. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
 - 13. Maintain minimum clearance of 12 inches (300 mm) between conduits and hot surfaces. This includes, but is not limited to:
 - a. Hot water piping.
 - b. Flues.
 - 14. Group parallel conduits in same area on common rack.
- K. 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 conduit clamp to support single conduit from beam clamp or threaded rod.
 - 7. Use trapeze hangers assembled from threaded rods and metal channel/strut with accessory conduit clamps to support multiple parallel suspended conduits.

8. Use of spring steel conduit clips for support of conduits is not permitted.
 9. Use of wire for support of conduits is not permitted.
 10. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with most stringent requirements.
- L. 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.
- M. 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.
- N. Underground Installation:
1. Provide trenching and backfilling; see Section 31 2316 and Section 31 2323.
 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.
- O. 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.
- P. 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 calculated in accordance with NFPA 70 for reinforced thermosetting resin conduit (RTRC) conduit installed above ground to compensate for thermal expansion and contraction.
 4. Where conduits are subject to earth movement by settlement or frost.

Q. 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.

R. Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches (300 mm) at each end.

S. Provide grounding and bonding; see Section 26 0526.

T. Identify conduits; see Section 26 0553.

3.02 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements for additional requirements.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.
- D. Correct deficiencies and replace damaged or defective conduits.

3.03 CLEANING

- A. Clean interior of conduits to remove moisture and foreign matter.

3.04 PROTECTION

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

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. Boxes and enclosures for integrated power, data, and audio/video.
- D. Floor boxes.
- E. Underground boxes/enclosures.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete.
- B. Section 08 3100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
- C. Section 26 0529 - Hangers and Supports for Electrical Systems.
- D. Section 26 0533.13 - Conduit for Electrical Systems:
 - 1. Conduit bodies and other fittings.
 - 2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
- E. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 26 2726 - Wiring Devices:
 - 1. Wall plates.
 - 2. Floor box service fittings.
 - 3. Additional requirements for locating boxes for wiring devices.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.
- C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- 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. SCTE 77 - Specifications for Underground Enclosure Integrity; 2023.
- H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- J. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.
- K. 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.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

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 EN 10250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
 2. NEMA EN 10250 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. Boxes and Enclosures for Integrated Power, Data, and Audio/Video: Size and configuration as indicated or as required with partitions to separate services; field-connected gangable boxes may be used.
- E. 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. Manufacturer: Same as manufacturer of floor box service fittings.
- F. Underground Boxes/Enclosures:
1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
 2. Size: As required for application.
 3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches (300 mm).
 4. Applications:
 - a. Sidewalks and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 8 load rating.
 - b. Parking Lots, in Areas Subject Only To Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 15 load rating.
 - c. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.
 5. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.
 - a. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive boxes.
- 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 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. Provide separate boxes for emergency power and normal power systems.
- E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
- G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
- H. 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.
 - a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 2726.
 - 4. Locate boxes so that wall plates do not span different building finishes.
 - 5. Locate boxes so that wall plates do not cross masonry joints.
 - 6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
 - 7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.
 - 8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) horizontal separation.
 - 9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
 - 10. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 0533.13.
 - 11. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
 - a. Concealed above accessible suspended ceilings.
 - b. Within joists in areas with no ceiling.
 - c. Electrical rooms.
 - d. Mechanical equipment rooms.
- I. 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.
- J. Install boxes plumb and level.
- K. 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.
- L. Floor-Mounted Cabinets: Mount on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 03 3000.

- M. Install boxes as required to preserve insulation integrity.
- N. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.
- O. Nonmetallic Floor Boxes: Cut box flush with finished floor after concrete pour.
- P. Underground Boxes/Enclosures:
 - 1. Install enclosure on gravel base, minimum 6 inches (150 mm) deep.
 - 2. Flush-mount enclosures located in concrete or paved areas.
 - 3. Mount enclosures located in landscaped areas with top at 1 inch (25 mm) above finished grade.
 - 4. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.
- Q. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- R. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
- S. Close unused box openings.
- T. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- U. Provide grounding and bonding in accordance with Section 26 0526.
- V. Identify boxes in accordance with Section 26 0553.

3.03 CLEANING

- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.04 PROTECTION

- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

BUILDING FOR ROGERS FACILITIES DEPARTMENT
ROGERS, AR

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DEMX ARCHITECTURE
FAYETTEVILLE, AR

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. Floor marking tape.
- G. Warning signs and labels.

1.02 RELATED REQUIREMENTS

- A. Section 09 9113 - Exterior Painting.
- B. Section 09 9123 - Interior Painting.
- C. 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.
- D. Section 26 0573 - Power System Studies: Arc flash hazard warning labels.
- E. Section 26 2726 - Wiring Devices: Device and wallplate finishes; factory pre-marked wallplates.

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.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:
 - 1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
 - 2. Do not install identification products until final surface finishes and painting are 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 each product.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

1.07 FIELD CONDITIONS

- A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

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. 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.
 - b. Enclosed switches, circuit breakers, and motor controllers:
 - 1) Identify voltage and phase.
 - 2) Identify power source and circuit number. Include location when not within sight of equipment.
 - c. Transfer Switches:
 - 1) Identify voltage and phase.
 - 2) Identify power source and circuit number for both normal power source and standby power source. Include location when not within sight of equipment.
 - 3) Identify short circuit current rating based on the specific overcurrent protective device type and settings protecting the transfer switch.
 2. Service Equipment:
 - a. Use identification nameplate to identify each service disconnecting means.
 3. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
 4. Use field-painted floor markings, floor marking tape, or warning labels to identify required equipment working clearances where indicated or where required by the authority having jurisdiction.
 - a. Field-Painted Floor Markings: Alternating black and white stripes, 3 inches (76 mm) wide, painted in accordance with Section 09 9123 and 09 9113.
 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.
 7. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.
- 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 Raceways:

1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet (6.1 m).
 2. Use voltage markers, color-coded bands, or factory-painted conduits to identify systems other than normal power system for accessible conduits.
 - a. Maximum Intervals: 20 feet (6.1 m).
 - b. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches (76 mm) wide.
 - 1) Field-Painting: Comply with Section 09 9123 and 09 9113.
 - 2) Vinyl Color Coding Electrical Tape: Comply with Section 26 0519.
 - c. Color Code:
 - 1) Fire Alarm System: Red.
 3. Use underground warning tape to identify underground raceways.
- D. Identification for Boxes:
1. Use voltage markers to identify highest voltage present.
 2. Use voltage markers or color coded boxes to identify systems other than normal power system.
 - a. Color-Coded Boxes: Field-painted in accordance with Section 09 9123 and 09 9113 per the same color code used for raceways.
- E. Identification for Devices:
1. Wiring Device and Wallplate Finishes: Comply with Section 26 2726.
 2. Use identification label to identify fire alarm system devices.
 3. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

- A. Identification Nameplates:
1. Materials:
 - a. Indoor Clean, Dry Locations: Use plastic nameplates.
 - b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
 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.
 3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
 4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
 5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.
- 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.
- C. Format for Equipment Identification:
1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
 2. Legend:
 - a. Equipment designation or other approved description.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height:
 - a. Equipment Designation: 1/2 inch (13 mm).
 5. Color:
 - a. Normal Power System: White text on black background.

- b. Fire Alarm System: White text on red background.
- D. Format for General Information and Operating Instructions:
 - 1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
 - 2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 1/4 inch (6 mm).
 - 5. Color: Black text on white background unless otherwise indicated.
- E. Format for Caution and Warning Messages:
 - 1. Minimum Size: 2 inches (51 mm) by 4 inches (100 mm).
 - 2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 1/2 inch (13 mm).
 - 5. Color: Black text on yellow background unless otherwise indicated.
- F. Format for Receptacle Identification:
 - 1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
 - 2. Legend: Power source and circuit number or other designation indicated.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 3/16 inch (5 mm).
 - 5. Color: Black text on clear background.
- G. Format for Fire Alarm Device Identification:
 - 1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
 - 2. Legend: Designation indicated and device zone or address.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 3/16 inch (5 mm).
 - 5. Color: Red text on white background.

2.03 WIRE AND CABLE MARKERS

- A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
- B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- C. Legend: Power source and circuit number or other designation indicated.
- D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
- E. Minimum Text Height: 1/8 inch (3 mm).
- F. Color: Black text on white background unless otherwise indicated.

2.04 VOLTAGE MARKERS

- A. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.
- B. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.
- C. Minimum Size:
 - 1. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
 - 2. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches (29 by 110 mm).
 - 3. Markers for Junction Boxes: 1/2 by 2 1/4 inches (13 by 57 mm).
- D. Legend:
 - 1. Markers for Voltage Identification: Highest voltage present.

2. Markers for System Identification:

- E. Color: Black text on orange background unless otherwise indicated.

2.05 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:

2.06 FLOOR MARKING TAPE

- A. Floor Marking Tape for Equipment Working Clearance Identification: Self-adhesive vinyl or polyester tape with overlamine, 3 inches (76 mm) wide, with alternating black and white stripes.

2.07 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.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
1. Surface-Mounted Equipment: Enclosure front.
 2. Flush-Mounted Equipment: Inside of equipment door.
 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
 4. Elevated Equipment: Legible from the floor or working platform.
 5. Branch Devices: Adjacent to device.
 6. Interior Components: Legible from the point of access.
 7. Conduits: Legible from the floor.
 8. Boxes: Outside face of cover.
 9. Conductors and Cables: Legible from the point of access.
 10. Devices: Outside face of cover.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

- F. Install underground warning tape above buried lines with one tape per trench at 3 inches (75 mm) below finished grade.
- G. Mark all handwritten text, where permitted, to be neat and legible.

3.02 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION

**SECTION 26 0583
WIRING CONNECTIONS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical connections to equipment.

1.02 RELATED REQUIREMENTS

- A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.
- B. Section 26 0533.16 - Boxes for Electrical Systems.
- C. Section 26 2726 - Wiring Devices.
- D. Section 26 2816.16 - Enclosed Switches.

1.03 REFERENCE STANDARDS

- A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).
- B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
 - 2. Determine connection locations and requirements.
- B. Sequencing:
 - 1. Install rough-in of electrical connections before installation of equipment is required.
 - 2. Make electrical connections before required start-up of equipment.

1.05 SUBMITTALS

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

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
 - 1. Colors: Comply with NEMA WD 1.
 - 2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
 - 3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.
- B. Disconnect Switches: As specified in Section 26 2816.16 and in individual equipment sections.
- C. Wiring Devices: As specified in Section 26 2726.
- D. Wire and Cable: As specified in Section 26 0519.
- E. Boxes: As specified in Section 26 0533.16.

2.02 EQUIPMENT CONNECTIONS

- A. As required or indicated on drawings:

PART 3 EXECUTION

3.01 ELECTRICAL CONNECTIONS

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Provide receptacle outlet to accommodate connection with attachment plug.
- E. Provide cord and cap where field-supplied attachment plug is required.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- H. Install terminal block jumpers to complete equipment wiring requirements.
- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

**SECTION 26 0923
LIGHTING CONTROL DEVICES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Occupancy sensors.
- B. Outdoor photo controls.
- C. Lighting contactors.

1.02 RELATED REQUIREMENTS

- A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.
- B. Section 26 0529 - Hangers and Supports for Electrical Systems
- C. Section 26 0533.16 - Boxes for Electrical Systems.
- D. Section 26 2726 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.
- E. Section 26 5100 - Interior Lighting.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.
- C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- D. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).
- E. NEMA IA 10030 - Industrial Control and Systems: Enclosures; 2024.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control; Current Edition, Including All Revisions.
- H. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.
- I. UL 60947-1 - Low-Voltage Switchgear and Controlgear - Part 1: General Rules; Current Edition, Including All Revisions.
- J. UL 60947-4-1 - Low-Voltage Switchgear and Controlgear - Part 4-1: Contactors and Motor-starters - Electromechanical Contactors and Motor-starters; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate placement of lighting control devices with millwork, furniture, equipment and other potential conflicts.
 - 2. Coordinate placement of wall switch occupancy sensors with installed door swings.
 - 3. Coordinate placement of occupancy sensors with millwork, furniture, equipment and other potential obstructions to motion detection coverage.
 - 4. Coordinate lighting control device product selections with luminaire characteristics; see Section 26 5100 and lighting fixture schedule.
 - 5. Notify Architect of conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.
- B. Sequencing:

1.05 SUBMITTALS

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

- B. Field quality control reports.

1.06 QUALITY ASSURANCE

- A. Comply with NFPA 70.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Store products in clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.08 FIELD CONDITIONS

1.09 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 duration below. Complete forms in Owner's name and register with manufacturer.
 - 1. Occupancy Sensors: 5 years.

PART 2 PRODUCTS

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for purpose intended.
- B. Unless specifically indicated as excluded, provide components necessary for complete operating system including, but not limited to, conduit, wiring, connectors, hardware, and accessories.

2.02 OCCUPANCY SENSORS

- A. General Requirements:
 - 1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
 - 2. Sensor Technology:
 - a. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using combination of both passive infrared and ultrasonic technologies.
 - 3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
 - 4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during adjustable turn-off delay time interval.
 - 5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
 - 6. Passive Infrared Lens Field of View: Field customizable by addition of factory masking material, adjustment of integral blinders, or similar means to block motion detection in selected areas.
 - 7. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
 - 8. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
- B. Wall Switch Occupancy Sensors:
 - 1. General Requirements:
 - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.

- b. Unless otherwise indicated or required to control load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.
 - c. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during delayed-off time interval.
 - d. Finish: Color to be selected.
 - 2. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within area required.
- C. Wall Dimmer Occupancy Sensors:
 - 1. General Requirements:
 - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with field of view of 180 degrees, integrated dimming control capability, and no leakage current to load in off mode.
 - b. Manual-Off Override Control Capability: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during delayed-off time interval.
 - c. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.
 - d. Finish: Color to be selected<>.
- D. Ceiling Mounted Occupancy Sensors:
 - 1. General Requirements:
 - a. Description: Low profile occupancy sensors designed for ceiling installation.
 - b. Unless otherwise indicated or required to control load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.
 - c. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
 - 2. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
 - a. Standard Range Sensors: Capable of detecting motion within area as required with field of view of 360 degrees.
- E. Power Packs for Low-Voltage Occupancy Sensors:
 - 1. Description: Plenum rated, self-contained low-voltage class 2 transformer and relay compatible with specified low-voltage occupancy sensors for switching of line-voltage loads.
 - 2. Provide quantity and configuration of power and slave packs with associated wiring and accessories as required to control load indicated on drawings.
 - 3. Input Supply Voltage: Dual rated for 120/277 V ac.
 - 4. Load Rating: As required to control load indicated on drawings.

2.03 OUTDOOR PHOTO CONTROLS

- A. Stem-Mounted Outdoor Photo Controls:
 - 1. Description: Direct-wired photo control unit with threaded conduit mounting stem and field-adjustable swivel base, listed and labeled as complying with UL 773A.
 - 2. Housing: Weatherproof, impact resistant polycarbonate.
 - 3. Photo Sensor: Cadmium sulfide.
 - 4. Provide external sliding shield for field adjustment of light level activation.
 - 5. Light Level Activation: 1 to 5 footcandles (10.8 to 53.8 lux) turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
 - 6. Voltage: As required to control load indicated on drawings.
 - 7. Failure Mode: Fails to the on position.
 - 8. Load Rating: As required to control load indicated on drawings.

2.04 LIGHTING CONTACTORS

- A. Description: Magnetic lighting contactors complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; combination or noncombination type as indicated; ratings, configurations and features as indicated on drawings.
- B. Combination Contactors: NEMA ICS 2, Class A combination controllers with magnetic contactors and externally operable disconnect.
 - 1. Disconnects: Circuit breaker type.
 - a. Provide externally operable handle with means for locking in the OFF position. Provide safety interlock to prevent opening cover with disconnect in the ON position with capability of overriding interlock for testing purposes.
 - b. Provide auxiliary interlock for disconnection of external control power sources where applicable.
- C. Enclosures:
 - 1. Comply with NEMA IA 10030.
 - 2. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
 - 3. Finish: Manufacturer's standard unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.
- F. Verify that service voltage and ratings of lighting control devices are appropriate for service voltage and load requirements at location to be installed.
- G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Install lighting control devices 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 as required for installation of lighting control devices; see Section 26 0533.16.
 - 1. Mounting Heights: Unless otherwise indicated, as follows:
 - a. Wall Switch Occupancy Sensors: 48 inches (1.2 m) above finished floor.
 - 2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.
 - 3. Locate wall switch occupancy sensors 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.
- C. Maintain separation of remote-control, signaling, and power-limited circuits.

1. See manufacturer instructions and Section 26 0519 for control wiring conductors, wiring methods, and identification requirements.
- D. Install lighting control devices in accordance with manufacturer's instructions.
- E. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- F. Install lighting control devices plumb and level, and held securely in place.
- G. Where required and not furnished with lighting control device, provide wall plate; see Section 26 2726.
- H. Provide required supports; see Section 26 0529.
- I. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface 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.
- J. Occupancy Sensor Locations:
 1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for complete coverage of respective room or area based on manufacturer's recommendations for installed devices.
 2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors minimum of 4 feet (1.2 m) from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.
- K. Outdoor Photo Control Locations:
 1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.
 2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by photo control itself.
- L. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into photo control.
- M. Combination Enclosed Lighting Contactors:
 1. Except where indicated to be mounted adjacent to equipment they supply, mount lighting contactors such that highest position of operating handle does not exceed 79 inches (2000 mm) above floor or working platform.
- N. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near sensor location.
- O. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect each lighting control device for damage and defects.
- C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.
- D. Test outdoor photo controls to verify proper operation, including time delays where applicable.
- E. Correct wiring deficiencies and replace damaged or defective conductors, cables, and lighting control devices.

3.05 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.

- B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.
- C. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.
- D. Adjust external sliding shields on outdoor photo controls under optimum lighting conditions to achieve desired turn-on and turn-off activation as indicated or as directed by Architect.

3.06 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

- A. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2. Location: At project site.

END OF SECTION

SECTION 26 2100
LOW-VOLTAGE ELECTRICAL SERVICE ENTRANCE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical service requirements.

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 0553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 31 2316 - Excavation.
- E. Section 31 2323 - Fill: Bedding and backfilling.

1.03 DEFINITIONS

- A. Service Point: The point of connection between the facilities of the serving utility and the premises wiring as defined in NFPA 70, and as designated by the Utility Company.

1.04 REFERENCE STANDARDS

- A. IEEE C2 - National Electrical Safety Code(R) (NESC(R)); 2023.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. No later than two weeks following date of the Agreement, notify Utility Company of anticipated date of service.
- B. Coordination:
 - 1. Verify the following with Utility Company representative:
 - a. Utility Company requirements, including division of responsibility.
 - b. Exact location and details of utility point of connection.
 - c. Utility easement requirements.
 - d. Utility Company charges associated with providing service.
 - 2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for electrical service and associated equipment.
 - 3. Coordinate arrangement of service entrance equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 4. Coordinate the work with other installers to provide communication lines required for Utility Company meters.
 - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- C. Arrange for Utility Company to provide permanent electrical service. Prepare and submit documentation required by Utility Company.
- D. Utility Company charges associated with providing permanent service to be paid by Owner.
- E. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Utility Company representative.
- F. Scheduling:
 - 1. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.06 SUBMITTALS

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

1.07 QUALITY ASSURANCE

- A. Comply with the following:
 - 1. IEEE C2 (National Electrical Safety Code).
 - 2. NFPA 70 (National Electrical Code).
 - 3. The requirements of the Utility Company.
 - 4. The requirements of the local authorities having jurisdiction.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.
- B. Store products indoors in a clean, dry space having a uniform temperature to prevent condensation (including outdoor rated products which are not weatherproof until completely and properly installed). Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle products carefully to avoid damage to internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 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. Electrical Service Characteristics: As indicated on drawings.
- C. Utility Company: To be determined by Contractor.
- D. Division of Responsibility: Per Utility Company requirements.
- E. Products Furnished by Contractor: Comply with Utility Company requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that ratings and configurations of service entrance equipment are consistent with the indicated requirements.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

3.03 INSTALLATION

- A. Install products in accordance with manufacturer's instructions and Utility Company requirements.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances and required maintenance access.
- D. Provide required trenching and backfilling in accordance with Section 31 2316 and Section 31 2323.
- E. Provide required support and attachment components in accordance with Section 26 0529.
- F. Provide grounding and bonding for service entrance equipment in accordance with Section 26 0526.
- G. Identify service entrance equipment, including main service disconnect(s) in accordance with Section 26 0553.

3.04 PROTECTION

- A. Protect installed equipment from subsequent construction operations.

END OF SECTION

BUILDING FOR ROGERS FACILITIES DEPARTMENT
ROGERS, AR

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DEMX ARCHITECTURE
FAYETTEVILLE, AR

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 26 0526 - Grounding and Bonding for Electrical Systems.
- B. Section 26 0529 - Hangers and Supports for Electrical Systems.
- C. 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 Amendments (2022).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.
- D. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- E. NEMA PB 1 - Panelboards; 2011.
- F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 1000V or Less; 2023.
- G. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
- 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 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- M. UL 943 - Ground-Fault Circuit-Interrupters; 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 the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
 - 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: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
- C. 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.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

- A. Maintain ambient temperature within the following limits during and after installation of panelboards:
 - 1. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Source Limitations: Provide panelboards and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from a single supplier.

2.02 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. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- F. 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.
- G. Conductor Terminations: Suitable for use with the conductors to be installed.
- H. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - b. Outdoor Locations: Type 3R.
2. Boxes: Galvanized steel unless otherwise indicated.
 - a. Provide wiring gutters sized to accommodate the conductors to be installed.
 - b. Provide removable end walls for NEMA Type 1 enclosures.
 - c. Provide painted steel boxes for surface-mounted panelboards where indicated, finish to match fronts.
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.
- I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- J. 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.
- K. Load centers are not acceptable.

2.03 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.

2.04 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.

2.05 OVERCURRENT PROTECTIVE DEVICES

- A. 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:
 - 1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
 - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
 3. Conductor Terminations:
 - a. Provide mechanical lugs unless otherwise indicated.
 - b. 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.
 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.
 - b. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.
 7. Do not use tandem circuit breakers.
 8. Do not use handle ties in lieu of multi-pole circuit breakers.
 9. Provide the following features and accessories where indicated or where required to complete installation:
 - a. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.

2.06 SOURCE QUALITY CONTROL

- A. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive panelboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 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. Install panelboards plumb.
- G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
- H. 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.
- I. 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.
- J. Provide grounding and bonding in accordance with Section 26 0526.
- K. Install all field-installed branch devices, components, and accessories.
- L. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.
- M. Provide filler plates to cover unused spaces in panelboards.
- N. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
 - 1. Fire detection and alarm circuits.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than _____ amperes. Tests listed as optional are not required.
- D. Test GFCI circuit breakers to verify proper operation.
- E. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of panelboard fronts.

3.05 CLEANING

- A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

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SECTION 26 2726 WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall switches.
- B. Wall dimmers.
- C. Receptacles.
- D. Wall plates and covers.
- E. Floor box service fittings.

1.02 RELATED REQUIREMENTS

- A. Section 26 0533.16 - Boxes for Electrical Systems.
- B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

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 (Validated 2023).
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- 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. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.
- I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.
- J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.
- K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
- L. UL 1472 - Solid-State Dimming Controls; 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. 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.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.01 WIRING DEVICES - GENERAL REQUIREMENTS

- A. Provide wiring devices suitable for intended use with ratings adequate for load served.
- B. Except where explicitly permitted, substitution of combination switch-and-receptacle devices for separate switches and receptacles is not permitted.
- C. Wiring Device Applications:
 - 1. Receptacles Installed Outdoors or in Damp or Wet Locations: Use weather-resistant GFCI receptacles with weatherproof covers.
 - 2. Provide GFCI protection for:
 - a. Receptacles installed within 6 feet (1.8 m) of sinks.
 - b. Receptacles serving electric drinking fountains.
- D. Wiring Device Finishes:
 - 1. Provide wiring device finishes as required by A.

2.02 WALL SWITCHES

- A. 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 WALL DIMMERS

- A. General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.
- B. Power Rating, Unless Otherwise Indicated or Required to Control the Load Indicated on the Drawings:

2.04 RECEPTACLES

- A. General Requirements: 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. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
 - 2. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled 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. 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. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
 - 3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.
- D. Locking Receptacles: Industrial specification grade, configuration as indicated on the drawings.

2.05 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. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.
- C. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.
- D. Brass Wall Plates: Brushed satin finish, factory-coated to inhibit oxidation.
- E. Aluminum Wall Plates: Smooth satin finish, clear anodized, factory-coated to inhibit oxidation.
- F. Chrome Wall Plates: Smooth finish, chrome plated steel.
- G. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.
- H. Premarked Wall Plates: Factory labeled as indicated; hot stamped for nylon wall plates and engraved for metal wall plates.
- I. Weatherproof Receptacle Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.
- J. 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.

2.06 FLOOR BOX SERVICE FITTINGS

- A. Description: Service fittings compatible with floor boxes provided under Section 26 0533.16 with components, adapters, and trims required for complete installation.
- B. Flush Floor Service Fittings:
 - 1. Dual Service Flush Combination Outlets:
 - a. Cover: Rectangular.
 - b. Configuration:
 - 1) Power: One standard convenience duplex receptacle(s) with duplex flap 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 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- F. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 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. Unless otherwise indicated, GFCI receptacles may be connected to provide feed-through protection to downstream devices. Label such devices to indicate they are protected by upstream GFCI protection.
- I. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- J. Install wall switches with OFF position down.

- K. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
- 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.
- P. Identify wiring devices in accordance with Section 26 0553.

3.04 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.

3.05 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.

3.06 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

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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 0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- C. NEMA BS 31047 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013 (Reaffirmed 2023).
- D. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within 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. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 4. 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 enclosed switches and other installed components and accessories.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

- A. Maintain ambient temperature between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C) during and after installation of enclosed switches.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Source Limitations: Provide enclosed switches and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from single supplier.

2.02 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. 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).
- D. Horsepower Rating: Suitable for connected load.
- E. Voltage Rating: Suitable for circuit voltage.
- F. Provide with switch blade contact position that is visible when the cover is open.
- G. Conductor Terminations: Suitable for use with the conductors to be installed.
- H. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- I. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
- J. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- K. Heavy Duty Switches:
 - 1. Comply with NEMA BS 31047.
 - 2. Conductor Terminations:
 - a. Provide mechanical lugs unless otherwise indicated.
 - b. 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 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive enclosed safety switches.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 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. Install enclosed switches plumb.
- F. 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.
- G. Provide grounding and bonding in accordance with Section 26 0526.
- H. Identify enclosed switches in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.
- D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 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

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SECTION 26 3213
ENGINE GENERATOR AND AUTOMATIC TRANSFER SWITCH

SECTION 26 32 13 - ENGINE GENERATORS

PART 1 GENERAL

2.01 RELATED DOCUMENTS

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

2.02 SUMMARY

- A. This Section includes packaged engine-generator sets for standby power supply with the following features:
 - 1. Diesel engine.
 - 2. Unit-mounted cooling system.
 - 3. Performance requirements for sensitive loads.
 - 4. Outdoor enclosure.

2.03 DEFINITIONS

- A. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

2.04 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. IEEE 115 - IEEE Guide for Test Procedures for Synchronous Machines Including Acceptance and Performance Testing and Parameter Determination for Dynamic Analysis; 2019.
- C. NFPA 30 - Flammable and Combustible Liquids Code; 2024, with Errata (2025).
- D. NFPA 37 - Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines; 2024, with Amendment.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. NFPA 99 - Health Care Facilities Code; 2024, with Errata.
- G. NFPA 110 - Standard for Emergency and Standby Power Systems; 2025.
- H. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- I. UL 891 - Switchboards; Current Edition, Including All Revisions.
- J. UL 1008 - Transfer Switch Equipment; Current Edition, Including All Revisions.
- K. UL 1236 - Battery Chargers for Charging Engine-Starter Batteries; Current Edition, Including All Revisions.
- L. UL 2200 - Stationary Engine Generator Assemblies; Current Edition, Including All Revisions.

2.05 SUBMITTALS

- A. Product Data: For each type of packaged engine generator indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. In addition, include the following:
 - 1. Thermal damage curve for generator.
 - 2. Time-current characteristic curves for generator protective device.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Dimensioned outline plan and elevation drawings of engine-generator set, and other components specified.
 2. Design Calculations: Signed and sealed by a qualified professional engineer. Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
 3. Vibration Isolation Base Details: Signed and sealed by a qualified professional engineer. Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include base weights.
 4. Wiring Diagrams: Power, signal, and control wiring.
- C. Qualification Data: For manufacturer.
- D. Source quality-control test reports.
1. Certified summary of prototype-unit test report.
 2. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.
 3. Certified Summary of Performance Tests: Certify compliance with specified requirement to meet performance criteria for sensitive loads.
 4. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
 5. Report of sound generation.
 6. Report of exhaust emissions showing compliance with applicable regulations.
 7. Certified Torsional Vibration Compatibility: Comply with NFPA 110.
- E. Field quality-control test reports.
- F. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
1. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.

2.06 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
1. Maintenance Proximity: Not more than four hours' normal travel time from Installer's place of business to Project site.
 2. Engineering Responsibility: Preparation of data for vibration isolators and seismic restraints of engine skid mounts, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 150 miles of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.
- C. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- E. Comply with ASME B15.1.
- F. Comply with NFPA 37.
- G. Comply with NFPA 70.
- H. Comply with NFPA 110 requirements for Level 1 emergency power supply system.
- I. UL 2200. Equipment that does not have a factory offered LU2200 listing will not be considered.
- J. Engine Exhaust Emissions: Comply with applicable state and local government requirements.

2.07 COORDINATION

- A. Coordinate size and location of concrete bases for package engine generators. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

2.08 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 PRODUCTS

3.01 EQUIPMENT

- A. The generator set shall be manufactured by MTU/Rolls Royce by United Engines, Contact Adam Penland @ 501-590-3664.
- B. If the contractor wishes to propose equivalent equipment, it is to be submitted in a separate document at bid time. All additional costs associated with re-engineering and mechanical & electrical modifications to the installation will be at the contractor's expense. The contractor must also supply the details listed below with his equivalent proposal:
 - 1. The associated credit for the equivalent equipment.
 - 2. Any deviations from the specifications in a line by line format.
 - 3. The weight & outline dimensions.
 - 4. Upon request, the manufacturer shall provide a notarized letter certifying compliance with all the requirements of this specification. The certification shall identify, by serial number(s), the equipment involved. No exceptions to the specifications shall be allowed or included in the certification.

3.02 ENGINE-GENERATOR SET

- A. Factory-assembled and -tested, engine-generator set.
- B. Capacities and Characteristics:
 - 1. Power Output Ratings: See site detail in next section.
 - 2. Load factor rating must be a minimum of 85%
 - 3. Output Connections: See site detail in next section.
 - 4. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component.
- C. Site Locations and sizing:
 - 1. Site 1: MTU 6R0150 DS230, 230kW, 120/208, 3 Phase, 60HZ, 85% Load Factor
- D. Generator-Set Performance for Sensitive Loads:
 - 1. Steady-State Voltage Operational Bandwidth: 1 percent of rated output voltage from no load to full load.
 - 2. Steady-State Frequency Operational Bandwidth: Plus, or minus 0.25 percent of rated frequency from no load to full load.
 - 3. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
 - 4. Output Waveform: At no load, harmonic content measured line to neutral shall not exceed 2 percent total with no slot ripple. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
 - 5. Sustained Short-Circuit Current: For a 3-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to winding insulation or other generator system components.

6. Excitation System: Performance shall be unaffected by voltage distortion caused by nonlinear load.

3.03 ENGINE

- A. Fuel: Fuel oil, Grade DF-2.
- B. Rated Engine Speed: 1800 rpm.
- C. Coolant Jacket Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity.
- D. Governor: Adjustable isochronous, with speed sensing.
- E. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine-generator-set mounting frame and integral engine-driven coolant pump.
 1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
 2. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
 3. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
 4. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
 5. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.
- F. Muffler/Silencer: Residential type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.
- G. Air-Intake Filter: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.
- H. Starting System: 12 or 24-V electric, with negative ground.
 1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in Part 1 "Project Conditions" Article.
 2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
 3. Cranking Cycle: As required by NFPA 110 for system level specified.
 4. Battery: Adequate capacity within ambient temperature range specified in Part 1 "Project Conditions" Article to provide specified cranking cycle at least three times without recharging.
 5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
 6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 10 deg C regardless of external ambient temperature within range specified in Part 1 "Project Conditions" Article. Include accessories required to support and fasten batteries in place.
 7. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.
 8. Battery Charger: Current-limiting, automatic-equalizing and float-charging type. Unit shall comply with UL 1236 and include the following features:
 - a. Operation: Equalizing-charging rate of 6A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.

- b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg C to plus 60 deg C to prevent overcharging at high temperatures and undercharging at low temperatures.
- c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
- d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
- e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
- f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

3.04 FUEL OIL STORAGE

- A. Comply with NFPA 30.
- B. Base-Mounted Fuel Oil Tank: Factory installed and piped, complying with UL listed fuel oil tank. Features include the following:
 - 1. Tank level indicator.
 - 2. Capacity: 530 Gallon fuel tank good for 27 hours continuous operation at 100 percent rated power output.
 - 3. Vandal-resistant fill cap.
 - 4. Containment Provisions: Comply with requirements of authorities having jurisdiction.

3.05 CONTROL AND MONITORING

- A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the on position, generator set starts. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of a remote emergency-stop switch also shuts down generator set.
- B. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the generator set. Mounting method shall isolate the control panel from generator-set vibration.
 - 1. Wall-Mounting Cabinet Construction: Rigid, self-supporting steel unit complying with NEMA ICS 6. Power bus shall be copper. Bus, bus supports, control wiring, and temperature rise shall comply with UL 891.
 - 2. Current and Potential Transformers: Instrument accuracy class.
- C. Indicating and Protective Devices and Controls: As required by NFPA 110 for Level 1 system, and the following:
 - 1. AC voltmeter.
 - 2. AC ammeter.
 - 3. AC frequency meter.
 - 4. DC voltmeter (alternator battery charging).
 - 5. Engine-coolant temperature gage.
 - 6. Engine lubricating-oil pressure gage.
 - 7. Running-time meter.
 - 8. Ammeter-voltmeter, phase-selector switch(es).
 - 9. Generator-voltage adjusting rheostat.
 - 10. Fuel tank derangement alarm.
- D. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.

- E. Connection to Data Link: A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication is reserved for connections for data-link transmission of indications to remote data terminals. Data system connections to terminals are covered in Division 26 Section "Electrical Power Monitoring and Control."
- F. Remote Emergency-Stop Switch: Flush; wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

3.06 GENERATOR OVERCURRENT AND FAULT PROTECTION

- A. Generator Circuit Breaker: Insulated-case, electronic-trip type; 100 percent rated; complying with UL 489.
 - 1. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.
 - 2. Trip Settings: Selected to coordinate with generator thermal damage curve.
 - 3. Shunt Trip: Connected to trip breaker when generator set is shut down by other protective devices.
 - 4. Mounting: Adjacent to or integrated with control and monitoring panel.

3.07 OUTDOOR GENERATOR-SET ENCLOSURE – LEVEL 1

- A. Description: Vandal-resistant, weather protective steel housing, wind resistant up to 130 mph. Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Panels shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.
- B. Description: Prefabricated or preengineered enclosure with the following features:
 - 1. Construction: Galvanized-steel, metal-clad, integral structural-steel-framed building erected on concrete foundation.
 - 2. Structural Design and Anchorage: Comply with ASCE 7 for wind loads.
 - 3. Louvers: Equipped with bird screen and filter arranged to permit air circulation when engine is not running while excluding exterior dust, birds, and rodents.
 - 4. Hinged Doors: With padlocking provisions.

3.08 VIBRATION ISOLATION DEVICES

- A. Elastomeric Isolator Pads: Oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized-steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.

3.09 REMOTE ANNUNCIATOR PANEL

- A. Remote Display Panel: Comply with NFPA 99. An LED indicator light labeled with proper alarm conditions shall identify each alarm event, and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.
 - 1. Overcrank alarm.
 - 2. Coolant low-temperature alarm.
 - 3. High engine temperature pre-alarm.
 - 4. High engine temperature alarm.
 - 5. Low lube oil pressure alarm.
 - 6. Overspeed alarm.
 - 7. Low-fuel main tank alarm.
 - 8. Low coolant level alarm.
 - 9. Low-cranking voltage alarm.
 - 10. Contacts for local and remote common alarm.
 - 11. Audible-alarm silencing switch.
 - 12. Run-Off-Auto switch.
 - 13. Control switch not in automatic position alarm.

14. Fuel tank derangement alarm.
15. Fuel tank high-level shutdown of fuel supply alarm.
16. Lamp test.
17. Low-cranking voltage alarm.
18. Generator overcurrent-protective-device not-closed alarm.

3.10 AUTOMATIC TRANSFER SWITCH

- A. General: To be approved as a transfer switch manufacturer, the manufacturer shall have been regularly engaged in the production of UL 1008 listed transfer switches (that are brand names, documented, and offered for sale on the open market,) for a minimum of five (5) years, and shall provide factory trained parts and service support through a factory authorized distributor or service center that is regularly doing business in the area of the installation.
 1. The manufacturer shall supply printed literature containing diagrams, parts lists and description sufficient for the Owner's personnel, or subcontract supplier to install, operate, and perform normal service on the equipment
- B. Ratings: All transfer switches shall be UL listed per standard 1008. Transfer switch supplied shall be suitable for use on emergency and legally required standby system in accordance with ANSI-CI, rated for total system load. Transfer switch shall be rated to carry 100% of rated current continuously in the enclosure. Transfer switches which must be derated when installed inside enclosure (due to integral over-current devices or any other reasons) do not meet this specification. Transfer switch shall be rated for continuous operation in ambient temperatures of -40°C to +67°C. Main power switch contact shall be rated for 600 V.A.C.
- C. Operation: The transfer switch automatically starts the generator on interruption of normal power and transfers the load circuits when the set reaches proper speed and voltage. When normal power is restored, the automatic switch transfers the load back to the line and stops the generator set. The source being connected to the load supplies the switching power. A time delay circuit shall be supplied to provide a transition between de-energizing the generator and engaging utility power on retransfer.
 1. Transfer Action: Switch shall feature two operating coils electrically interlocked to provide positive, electrically guided action from NORMAL to STANDBY position. A mechanical interlock mechanism shall be provided to prevent both sources from supplying the load simultaneously
 2. The transfer switch main contacts shall double break design, solid silver cadmium oxide, mechanically held on the line side, permitting the operating coil to be de-energized, eliminating AC hum or vibration. Contact pressure shall be maintained by coil springs not subject to weakening or distortion as part of the current path. Individual heat resistant contact chambers shall prevent cross arcing. All models shall be rated for all classes of load, both inductive and non-inductive, at 600 volts, 250 volts tungsten lamp load. NO DERATING.
 3. Transfer switch shall be Service rated at 800 amp, 3 pole, 120/208 volt.
 4. Control Circuit: Start/stop circuit shall close the 2 or 3-wire remote circuit to start the standby set on interruption of normal line power and open the circuit again to stop the set on return of normal line power. Generator can have either 12 or 24 volt starting systems. Transfer switch pilot circuit shall initiate transfer to standby power when standby output reached approximately 90 percent of rated voltage. Line recovery contacts shall provide immediate retransfer to normal power if emergency power interrupts when supplying load, by bypassing time delay retransfer. Instant transfer relay to provide immediate retransfer to the line when normal power restores, eliminating the few seconds delay otherwise necessary for standby voltage to drop sufficiently. A test transfer switch shall simulate power outage. A terminal block shall be provided for remote test switch. A control circuit disconnect plug shall be provided for use when servicing control circuit of transfer switch which disconnects control circuits from the line without operating transfer switch.
 5. The following relays shall be included: Adjustable solid state time delay start, time delay transfer, time delay retransfer, time delay stop, and adjustable solid state under-voltage sensors. Phase loss relay and generator pickup relay shall be included.

6. Enclosure: The transfer switch and control components shall be mounted in a single door enclosure, NEMA 3R construction, wiring space to comply with 2002 NEC Table 312.6(A). Meters and lamps are to be front mounted and readable with the cabinet closed. The cabinet is to be designed for wall mounting and will be provided with padlock hasps.
7. Normal and emergency lights shall be included.
8. Exerciser: Transfer switch shall be equipped with a programmable time clock which shall start the engine once every seven days. A switch shall be provided to select exercising under "load" or "no load."

3.11 FINISHES

- A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

3.12 SOURCE QUALITY CONTROL

- A. Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.
 1. Tests: Comply with NFPA 110, Level 1 Energy Converters and with IEEE 115.
- B. Project-Specific Equipment Tests: Before shipment, factory test engine-generator set and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:
 1. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.
 2. Full load run.
 3. Maximum power.
 4. Voltage regulation.
 5. Transient and steady-state governing.
 6. Single-step load pickup.
 7. Safety shutdown.
 8. Provide 14 days' advance notice of tests and opportunity for observation of tests by Owner's representative.
 9. Report factory test results within 10 days of completion of test.

PART 3 EXECUTION

4.01 EXAMINATION

- A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine-generator performance.
- B. Examine roughing-in of piping systems and electrical connections. Verify actual locations of connections before packaged engine-generator installation.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

4.02 INSTALLATION

- A. Comply with packaged engine-generator manufacturers' written installation and alignment instructions and with NFPA 110.
- B. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.
- C. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

4.03 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.
- B. Tests and Inspections:

1. Perform tests recommended by manufacturer and each electrical test and visual and mechanical inspection for "AC Generators and for Emergency Systems" specified in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here including, but not limited to, single-step full-load pickup test.
 3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.
 - a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
 - b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
 - c. Verify acceptance of charge for each element of the battery after discharge.
 - d. Verify that measurements are within manufacturer's specifications.
 4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
 5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine-generator system before and during system operation. Check for air, exhaust, and fluid leaks.
 6. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases and verify that performance is as specified.
 7. Harmonic-Content Tests: Measure harmonic content of output voltage under 25 percent and at 100 percent of rated linear load. Verify that harmonic content is within specified limits.
- C. Coordinate tests with tests for transfer switches and run them concurrently.
 - D. Test instruments shall have been calibrated within the last 12 months, traceable to standards of NIST, and adequate for making positive observation of test results. Make calibration records available for examination on request.
 - E. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - F. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - G. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - H. Remove and replace malfunctioning units and retest as specified above.
 - I. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.
 1. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

4.04 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION

BUILDING FOR ROGERS FACILITIES DEPARTMENT
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DEMX ARCHITECTURE
FAYETTEVILLE, AR

**SECTION 26 4300
SURGE PROTECTIVE DEVICES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surge protective devices for distribution locations.

1.02 RELATED REQUIREMENTS

- A. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- B. Section 26 2416 - Panelboards.

1.03 ABBREVIATIONS AND ACRONYMS

- A. SPD: Surge Protective Device.

1.04 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- 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.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate size and location of overcurrent device compatible with the actual surge protective device and location to be installed. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to ordering equipment.

1.06 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.

1.07 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

1.08 DELIVERY, STORAGE, AND PROTECTION

- A. Store in a clean, dry space in accordance with manufacturer's written instructions.

1.09 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.10 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 factory-installed, internally-mounted 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.
- F. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.
- G. Enclosure Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
- H. Equipment Containing Factory-installed, Internally Mounted SPDs: Listed and labeled as a complete assembly including SPD.
 1. Panelboards: See Section 26 2416.

2.03 SURGE PROTECTIVE DEVICES FOR DISTRIBUTION LOCATIONS

- A. Distribution locations include SPDs connected to distribution panelboards.
- B. 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.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the service voltage and configuration marked on the SPD are consistent with the service voltage and configuration at the location to be installed.
- C. Verify system grounding and bonding is in accordance with Section 26 0526, including bonding of neutral and ground for service entrance and separately derived systems where applicable. Do not energize SPD until deficiencies have been corrected.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 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.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.

3.04 CLEANING

- A. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

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DEMX ARCHITECTURE
FAYETTEVILLE, AR

SECTION 26 5100 INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Interior luminaires.
- B. Emergency lighting units.
- C. Exit signs.
- D. Ballasts and drivers.

1.02 RELATED REQUIREMENTS

- A. Section 26 0529 - Hangers and Supports for Electrical Systems.
- B. Section 26 0533.16 - Boxes for Electrical Systems.

1.03 REFERENCE STANDARDS

- A. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2024.
- B. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.
- C. NECA/IESNA 500 - Standard for Installing Indoor Lighting Systems; 2006.
- D. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.
- E. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2023.
- 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.

1.04 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.

1.05 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.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 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. Recessed Luminaires:
 - 1. Ceiling Compatibility: Comply with NEMA LE 4.
 - 2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
- H. 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.

2.03 EMERGENCY LIGHTING UNITS

- A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
- B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps

to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

- C. Battery:
 - 1. Size battery to supply all connected lamps, including emergency remote heads where indicated.
- D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
- E. Provide low-voltage disconnect to prevent battery damage from deep discharge.
- F. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.
- G. Accessories:
 - 1. Provide compatible accessory mounting brackets where indicated or required to complete installation.

2.04 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.
- B. Powered Exit Signs: Internally illuminated with LEDs unless otherwise indicated.
 - 1. Self-Powered Exit Signs:
 - a. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
 - b. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
 - c. Provide low-voltage disconnect to prevent battery damage from deep discharge.

2.05 BALLASTS AND DRIVERS

- A. Ballasts/Drivers - General Requirements:
 - 1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
 - 2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
- B. Dimmable LED Drivers:
 - 1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
 - 2. Control Compatibility: Fully compatible with the dimming controls to be installed.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 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.
- I. Install accessories furnished with each luminaire.
- J. Bond products and metal accessories to branch circuit equipment grounding conductor.
- K. Emergency Lighting Units:
 - 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.
- 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.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Operate each luminaire after installation and connection to verify proper operation.

- D. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.
- E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.05 ADJUSTING

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.
- B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.
- C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

3.06 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.

3.07 CLOSEOUT ACTIVITIES

3.08 PROTECTION

- A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

BUILDING FOR ROGERS FACILITIES DEPARTMENT
ROGERS, AR

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DEMX ARCHITECTURE
FAYETTEVILLE, AR

SECTION 26 5600 EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Exterior luminaires.
- B. Ballasts.
- C. Poles and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 26 0529 - Hangers and Supports for Electrical Systems.
- B. Section 26 0533.16 - Boxes for Electrical Systems.

1.03 REFERENCE STANDARDS

- A. IEEE C2 - National Electrical Safety Code(R) (NESC(R)); 2023.
- B. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2024.
- 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; 2023.
- E. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2000 (Reaffirmed 2006).
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- H. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
 - 2. 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 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.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.

- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide 5-year manufacturer warranty for all 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, 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. 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.

2.03 BALLASTS AND DRIVERS

- A. Ballasts/Drivers - General Requirements:
 - 1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
 - 2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

2.04 POLES

- A. All Poles:
 - 1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.
 - 2. Material: Steel, unless otherwise indicated.
 - 3. Shape: Square straight, unless otherwise indicated.
 - 4. Finish: Match luminaire finish, unless otherwise indicated.
 - 5. Mounting Height: As indicated on drawings, unless otherwise indicated.
 - 6. Mounting: Install on concrete foundation, height as indicated on the drawings, unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 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. Maintain the following minimum clearances:
 - a. Comply with IEEE C2.
 - b. Comply with utility company requirements.
 - 2. Foundation-Mounted Poles:
 - a. Install foundations plumb.
 - b. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
 - c. Tighten anchor bolt nuts to manufacturer's recommended torque.
 - 3. Grounding:
 - a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.
 - 4. 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.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Operate each luminaire after installation and connection to verify proper operation.
- D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.05 ADJUSTING

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

3.06 CLEANING

- A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 PROTECTION

- A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

PART 1 – GENERAL**1.1 RELATED SECTIONS**

- A. Section 01 33 00 – Submittal Procedures
- B. Section 01 45 00 – Quality Control
- C. Section 31 05 16 – Aggregates for Earthwork
- D. Section 31 05 19 – Geotextiles
- E. Section 31 20 00 – Earth Moving
- F. Section 31 23 00 – Excavation and Fill
- G. Section 31 23 16 – Excavation and Backfill for Utilities
- H. Section 31 25 00 – Erosion and Sedimentation Controls
- I. Section 32 13 13 – Concrete Paving
- J. Section 32 90 00 – Planting

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort
 - 2. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort
 - 3. ASTM D2487 – Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
 - 4. ASTM D4253 – Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
 - 5. ASTM D4254 – Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density
 - 6. ASTM D4318 – Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
 - 7. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³)
 - 8. ASTM D4829 – Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
 - 9. ASTM D6938 – Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
- B. American Association of State Highway and Transportation Officials (AASHTO)
 - 1. AASHTO T99 – Moisture-Density Relations of Soils Using a 5.5-lb Rammer and 12-in. Drop
 - 2. AASHTO T180 – Moisture-Density Relations of Soils Using a 10-lb Rammer and 18-in. Drop
- C. International Building Code (IBC) 2021
- D. Occupational Safety and Health Administration (OSHA) Standards 29 CFR

- E. Local Jurisdictional Codes and Regulations (as applicable)

1.3 DEFINITIONS

- A. 1.3.1 Earthwork: All excavation, filling, backfilling, and grading operations required to prepare the site for construction.
- B. 1.3.2 Compaction: The process of increasing soil density by mechanical means to achieve specified soil properties.
- C. 1.3.3 Borrow Soil: Soil imported from off-site for use as fill.
- D. 1.3.4 Subgrade: The prepared surface on which subsequent construction or fill is placed.

1.4 SUBMITTALS

- A. Action Submittals
 - 1. Soil Reports including geotechnical investigation and analysis.
 - 2. Proposed excavation and earthwork plan with sequencing and equipment.
 - 3. Sources and specifications of imported fill materials including gradation and compaction characteristics.
 - 4. Compaction test plan and quality control procedures.
 - 5. Proposed erosion and sediment control plan related to earthwork operations.
 - 6. List of equipment to be used in earthwork operations.
- B. Informational Submittals
 - 1. Copies of permits and approvals related to earthwork.
 - 2. Material test reports for fill materials.
 - 3. Daily earthwork logs indicating volume of excavation/fill and compaction results.
 - 4. Certification of compliance for compaction and moisture content.
 - 5. Safety plan specific to excavation and earthwork activities.
 - 6. Records of field density tests and laboratory testing results.

1.5 QUALITY ASSURANCE

- A. Qualifications
 - 1. Engage a qualified geotechnical engineer to review soil conditions, perform testing, and provide recommendations.
 - 2. Employ experienced personnel and licensed contractors specializing in earthwork operations.
- B. Testing
 - 1. Perform soil classification, moisture content, and compaction testing per ASTM and AASHTO standards.
 - 2. Testing laboratory shall be accredited and independent from the contractor.
 - 3. Field density tests shall be conducted at a frequency not less than one test per 500 square feet per lift or as required by governing codes.

C. Verification

1. Verify excavation limits, subgrade elevations, and compaction levels prior to placement of fill or construction.
2. Perform pre-construction survey and documentation of existing site conditions.

D. Safety

1. Earthwork shall comply with OSHA requirements for excavation safety, including shoring, sloping, and protective systems.
2. Provide barricades, signage, and protective measures to secure excavation areas.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery

1. Deliver fill materials in a dry, uncompacted condition and free from debris, organic matter, and frozen materials.

B. Storage

1. Stockpile imported and on-site soils separately to prevent mixing of unsuitable materials.
2. Protect stockpiles from contamination and erosion by wind or rain.

C. Handling

1. Handle materials to prevent segregation or contamination.
2. Maintain moisture content within specified limits during handling and placement to ensure compaction quality.

1.7 WARRANTY

- A. Provide a warranty for earthwork materials and workmanship against defects for a period of one year from date of substantial completion.
- B. Warranty shall cover settlement, inadequate compaction, erosion, or failure of earthwork to perform as specified.
- C. Contractor shall promptly repair or replace defective work at no additional cost to the Owner.

PART 2 – PRODUCTS

2.1 SOILS AND FILL MATERIALS

A. General Requirements

1. Fill material shall be free from organic matter, roots, debris, frozen soil, and other deleterious materials.
2. Material shall meet gradation requirements per ASTM D2487 Soil Classification System as specified in project documents.

B. On-Site Soils

1. On-site soils may be used if tested and approved by the geotechnical engineer.
- C. Imported Fill
 1. Imported fill shall comply with project specifications and be approved prior to delivery.
 2. Gradation, plasticity, and compaction characteristics shall be provided by supplier.

2.2 GEOTEXTILES AND EROSION CONTROL MATERIALS

- A. Geotextiles shall conform to Section 31 05 19 and be used where indicated to separate fill materials or stabilize subgrade.
- B. Erosion control blankets and sediment barriers shall comply with Section 31 25 00.

2.3 MANUFACTURERS

- A. 2Soil Suppliers
 1. ABC Earth Materials Inc.
 2. XYZ Aggregate Supply Company
 3. National Fill Material Providers
- B. Geotextile and Erosion Control
 1. TenCate Geosynthetics
 2. Propex Operating Company LLC
 3. Huesker, Inc.
- C. Testing Laboratories
 1. SoilTech Laboratories
 2. GeoTest Engineering Services
 3. National Materials Testing, Inc.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that site conditions are ready to receive work and that underground utilities and structures are located and protected.
- B. Notify Engineer of any discrepancies or unsuitable conditions before proceeding.
- C. Verify that subgrade is free of frost, standing water, soft spots, debris, and frozen materials.

3.2 PREPARATION

- A. Clearing and Grubbing
 1. Remove trees, shrubs, roots, debris, and topsoil as indicated.

- B. Stripping and Stockpiling
 - 1. Strip topsoil from areas to be excavated or filled and stockpile separately.
- C. Excavation
 - 1. Excavate to subgrade elevations as indicated.
 - 2. Remove unsuitable or unstable soils as directed.
- D. Subgrade Preparation
 - 1. Scarify and loosen subgrade surface where required to achieve bonding with fill.
 - 2. Moisture condition subgrade to optimum moisture content for compaction.

3.3 FILL PLACEMENT AND COMPACTION

- A. Placement
 - 1. Place fill in horizontal lifts not exceeding 8 inches loose thickness unless otherwise approved.
 - 2. Maintain moisture content within plus or minus 2% of optimum moisture content.
- B. Compaction
 - 1. Compact each lift to not less than 95 percent of maximum dry density as determined by ASTM D698 or D1557.
 - 2. Use appropriate compaction equipment such as rollers, rammers, or vibratory compactors.
- C. Testing
 - 1. Perform field density tests at required frequencies.
 - 2. Provide results to Engineer for acceptance.
- D. Correction of Deficiencies
 - 1. Remove or rework areas failing to meet compaction or moisture requirements.
 - 2. Retest after corrective action until specified requirements are met.

3.4 GRADING

- A. Uniformly grade and shape earthwork areas to required elevations and slopes.
- B. Provide positive drainage away from structures and as indicated on drawings.
- C. Finish surfaces smooth and free of irregularities.

3.5 EROSION AND SEDIMENTATION CONTROL

- A. Implement erosion control measures during and after earthwork to prevent sediment runoff.
- B. Maintain temporary erosion control devices until permanent stabilization is established.

3.6 FIELD QUALITY CONTROL

- A. Inspection and Testing

1. Engineer or testing agency will perform periodic inspections and testing.
 2. Contractor shall cooperate and provide access and documentation.
- B. Non-Conformance
1. Immediately correct non-conforming work.
 2. Additional testing and inspection may be required at Contractor's expense.

3.7 PROTECTION

- A. Protect completed earthwork from disturbance or damage by subsequent construction activities.
- B. Repair or rework any damaged areas to meet original specifications.

3.8 CLEANING

- A. Remove surplus materials, debris, and equipment from site.
- B. Leave site in a clean and orderly condition.

END OF SECTION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.1 SUMMARY

- A. This Section includes the following:
1. Clearing and grubbing of vegetation and debris.
 2. Removal and disposal of trees, shrubs, roots, stumps, brush, and other vegetation.
 3. Stripping and stockpiling topsoil.
 4. Removal and disposal of existing improvements and debris as indicated.
 5. Site dewatering and sediment control as required during clearing operations.
- B. Related Sections include, but are not limited to:
1. Division 31 Section "Earth Moving" for excavation, backfilling, and grading.
 2. Division 31 Section "Erosion and Sedimentation Controls" for soil erosion prevention and sediment control.
 3. Division 32 Section "Landscape Grading" for final grading and landscape preparation.
 4. Division 32 Section "Soil Preparation" for soil amendments and preparation.
 5. Division 01 Section "Temporary Facilities and Controls" for temporary erosion and sedimentation control measures.

1.2 REFERENCES, CODES, AND STANDARDS

- A. Applicable codes and standards include but are not limited to:
1. American National Standards Institute (ANSI) Z133.1 - American National Standard for Arboricultural Operations – Safety Requirements.
 2. Occupational Safety and Health Administration (OSHA) Standards, 29 CFR Part 1926 - Safety and Health Regulations for Construction.
 3. ASTM International:
 - a) ASTM D448 - Standard Classification for Sizes of Aggregate for Road and Bridge Construction.
 - b) ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
 - c) ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
 4. U.S. Environmental Protection Agency (EPA) - Clean Water Act (CWA) for sediment control and stormwater management.
 5. Local and State Environmental Protection Regulations.

6. International Society of Arboriculture (ISA) Best Management Practices for Tree Removal and Protection.
7. National Fire Protection Association (NFPA) 241 - Standard for Safeguarding Construction, Alteration and Demolition Operations.

1.3 SUBMITTALS

A. Action Submittals:

1. Site Clearing Plan indicating limits of clearing, protection zones for existing trees to be preserved, stockpile locations, and sediment control measures.
2. Equipment List including types and capacity of equipment proposed for clearing operations.
3. Schedule of Clearing Activities including sequence and timing.
4. Waste Management Plan detailing disposal methods and recycling of cleared materials.
5. Certification of Compliance with applicable codes and standards.
6. Proposed Methods for Removal of Hazardous Vegetation or Material, if applicable.

B. Informational Submittals:

1. Copies of permits and notifications required for clearing operations.
2. Manufacturer's product data for erosion control products used during clearing.
3. Photographic documentation of site conditions before and after clearing.
4. Material Safety Data Sheets (MSDS) for chemicals or herbicides used, if any.

1.4 QUALITY ASSURANCE

- A. Perform site clearing work in accordance with recognized industry standards and manufacturers' recommendations.
- B. Personnel performing tree removal or trimming shall be certified arborists or experienced operators familiar with ANSI Z133.1 safety requirements.
- C. Maintain erosion and sediment controls at all times during clearing activities to prevent sedimentation of adjacent properties and water bodies.
- D. Comply with all local, state, and federal environmental regulations regarding protected species, wetlands, and historic resources.
- E. Pre-clearing meeting to be conducted with Owner, Contractor, and appropriate authorities to review clearing limits, protection measures, and safety protocols.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store erosion control materials, such as silt fencing, wattles, and blankets, in a dry, protected area to prevent damage and contamination.
- B. Handle cleared materials to prevent spillage and facilitate recycling or disposal.

- C. Maintain equipment in good working order and free of oil, fuel, or other contaminants that could cause environmental damage.
- D. Protect stockpiled topsoil from erosion, contamination, and compaction. Cover stockpiles when not actively used.

1.6 WARRANTY

- A. Provide warranty for clearing operations that all work will be free of defects in workmanship and materials for a period of one year from date of final acceptance.
- B. Warranty includes responsibility for repair or replacement of any damage to adjacent protected trees, utilities, or improvements caused by clearing operations.
- C. Warranty includes ensuring that no undesirable vegetation or debris remains that could affect subsequent construction or landscaping.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Erosion and Sediment Control Products:
 - 1. North American Green
 - 2. Profile Products LLC
 - 3. Best Management Products, Inc.
 - 4. Silt-Saver, Inc.
- B. Tree Protection Materials:
 - 1. Greenleaf Nursery Company
 - 2. Arborwear, Inc.
- C. Equipment Manufacturers (examples):
 - 1. Caterpillar Inc.
 - 2. John Deere
 - 3. Komatsu America Corp.

2.2 MATERIALS

- A. Erosion Control Materials: Silt fences, wattles, erosion control blankets, mulch, and soil stabilization products as specified in Division 31 Sections.
- B. Topsoil: Stockpiled native topsoil free of roots, debris, and contaminants.
- C. Disposal Containers: Containers and receptacles for collection and transport of cleared materials.
- D. Herbicides or Chemicals: Use only if specified and approved, and in accordance with applicable regulations and MSDS.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that utility locations have been identified and marked. Notify utility companies and the Owner of conflicts prior to clearing.
- B. Confirm limits of clearing and grubbing with the Owner's representative.
- C. Identify trees, vegetation, or site features to be preserved or protected.
- D. Inspect erosion and sediment control measures to ensure they are installed and functioning before clearing begins.

3.2 PREPARATION

- A. Install sediment and erosion control devices around the perimeter of the clearing area and at appropriate points downslope.
- B. Mark and protect trees and vegetation to remain using fencing or barricades.
- C. Conduct a pre-clearing meeting with all personnel involved to review safety, environmental protection, and clearing procedures.

3.3 CLEARING AND GRUBBING

- A. Remove all trees, shrubs, brush, roots, stumps, and other vegetation within the designated clearing limits.
- B. Remove above and below ground parts of vegetation including roots and stumps to a minimum depth of 18 inches below finished grade or as otherwise indicated.
- C. Remove man-made improvements, debris, rubbish, and other obstructions encountered within the clearing limits.
- D. Dispose of cleared materials off-site or process for reuse or recycling in accordance with the Waste Management Plan.
- E. Topsoil stripping: Strip, stockpile, and protect topsoil from erosion and contamination for reuse in landscaping or site restoration.
- F. Minimize disturbance to soils outside designated clearing limits.

3.4 TREE PROTECTION

- A. Maintain protective fencing and barriers around trees and vegetation to remain throughout construction.
- B. Prohibit parking, storage of materials, and heavy equipment traffic within tree protection zones.
- C. Repair damage to roots, trunks, or branches caused during clearing operations in accordance with ISA Best Management Practices.

3.5 EROSION AND SEDIMENT CONTROLS

- A. Maintain and monitor erosion control devices continuously during clearing operations.

- B. Repair or replace damaged or ineffective controls immediately.
- C. Remove sediment accumulations from control devices before capacity is exceeded.
- D. Restore disturbed areas promptly to minimize erosion.

3.6 FIELD QUALITY CONTROL

- A. Conduct inspections at the start and completion of clearing operations.
- B. Verify that clearing limits are adhered to and protective measures are effective.
- C. Document and report any damage to protected trees, utilities, or structures.
- D. Confirm proper disposal of debris and cleared materials.

3.7 CLEANING

- A. Remove all debris, rubbish, and waste materials from site clearing activities daily or as needed to maintain safe and orderly conditions.
- B. Restore areas outside clearing limits disturbed by clearing operations to original or better condition.

3.8 PROTECTION

- A. Protect newly cleared and stripped areas from unauthorized access and damage.
- B. Maintain erosion and sediment controls in good condition until final site stabilization is achieved.
- C. Protect adjacent properties from damage or encroachment.

3.9 COMPLETION

- A. Notify the Owner upon completion of clearing activities for inspection and acceptance.
- B. Provide documentation of completed clearing, including photographic evidence and waste disposal records.

END OF SECTION

BUILDING FOR ROGERS FACILITIES DEPARTMENT
ROGERS, AR

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DEMX ARCHITECTURE
FAYETTEVILLE, AR

PART 1 – GENERAL

1.1 RELATED SECTIONS

- A. Section 31 11 00 – Site Clearing
- B. Section 31 23 00 – Excavation and Fill
- C. Section 31 23 16 – Dewatering
- D. Section 31 25 00 – Erosion and Sediment Control
- E. Section 32 91 00 – Planting
- F. Section 01 33 00 – Submittal Procedures
- G. Section 01 45 00 – Quality Control
- H. Section 01 74 19 – Construction Waste Management and Disposal

1.2 REFERENCES, CODES, AND STANDARDS

- A. American National Standards Institute (ANSI)
 - 1. ANSI Z133.1 – American National Standard for Arboricultural Operations – Safety Requirements
- B. American Society for Testing and Materials (ASTM)
 - 1. ASTM D6274 – Standard Guide for Tree Preservation During Construction
 - 2. International Code Council (ICC)
 - 3. International Building Code (IBC), latest edition
 - 4. Occupational Safety and Health Administration (OSHA)
 - 5. OSHA 29 CFR 1926 – Safety and Health Regulations for Construction
 - 6. Society of American Foresters (SAF)
 - 7. SAF Best Management Practices for Forestry
 - 8. U.S. Department of Agriculture (USDA)
 - 9. USDA Urban Forestry Best Management Practices
 - 10. Local municipal and state regulations regarding tree protection and clearing operations

1.3 DEFINITIONS

- A. Selective Clearing: Removal of designated vegetation including trees, shrubs, and undergrowth according to project limits and plans, preserving specified vegetation and natural features.
- B. Protected Tree: Trees identified for preservation on project drawings or by the Owner/Architect.
- C. Clearing Limits: Boundaries established to define areas of selective clearing and protect remaining vegetation.

1.4 SUBMITTALS

A. Action Submittals

1. Clearing Plan indicating limits of clearing, protected trees, and tree protection measures.
2. Schedule of selective clearing operations.
3. List of equipment to be used for clearing.
4. Material Safety Data Sheets (MSDS) for herbicides or chemical agents if applicable.
5. Tree Protection Plan prepared by a qualified arborist if required.
6. Proposed erosion and sediment control measures related to clearing activities.

B. Informational Submittals

1. Qualifications of personnel performing selective clearing.
2. Manufacturer's literature for tree protection materials and equipment.
3. Photographic documentation of existing site conditions before clearing.
4. Waste management plan for clearing debris including disposal or recycling methods.

1.5 QUALITY ASSURANCE

- A. Perform selective clearing in accordance with ANSI Z133.1 safety standards and OSHA regulations.
- B. Engage personnel experienced in selective clearing and preservation techniques.
- C. Utilize qualified arborists for tree protection supervision and consultation.
- D. Verify clearing limits and protection measures in coordination with the Owner/Architect prior to commencement.
- E. Conduct pre-clearing site meeting to review limits, protection procedures, and safety requirements.
- F. Protect remaining vegetation in accordance with ASTM D6274 and USDA Urban Forestry Best Management Practices.
- G. Implement erosion and sediment control measures compliant with Section 31 25 00 and local environmental regulations.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials such as tree protection fencing, signage, and erosion control devices in original packaging with labels intact.
- B. Store materials on-site in designated areas protected from damage, moisture, and contamination.
- C. Protect stored materials from weather and construction traffic.
- D. Handle all clearing equipment and materials to prevent damage to protected vegetation and site features.
- E. Maintain access for emergency vehicles and personnel during clearing operations.

1.7 WARRANTY

- A. Provide warranty for selective clearing work, including protection of preserved vegetation, for a minimum period of one year from date of Substantial Completion.
- B. Warranty shall cover replacement or remediation of damage to protected trees and vegetation caused by clearing operations or failure to implement protection measures.
- C. Provide manufacturer's warranties for tree protection materials and equipment as applicable.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Tree Protection Fencing and Barriers
 - 1. Orange Safety Fence by Tenax Corporation
 - 2. Tree Save Products by Dewitt Company
 - 3. Chain Link Temporary Fencing by Master Halco
- B. Tree Protection Materials
 - 1. Burlap Wraps by Green-Tek Inc.
 - 2. Tree Trunk Guards by Tree Tech LLC
- C. Erosion and Sediment Control Products
 - 1. Silt Fence by Filtrexx International
 - 2. Straw Wattles by North American Green
- D. Herbicides and Chemical Agents (if applicable)
 - 1. Rodeo Herbicide by Dow AgroSciences
 - 2. Garlon Herbicide by Dow AgroSciences
- E. Clearing Equipment
 - 1. Hydraulic Excavators by Caterpillar Inc.
 - 2. Brush Chippers by Vermeer Corporation
 - 3. Chainsaws by Stihl Inc.

2.2 MATERIALS

- A. Tree Protection Fencing
 - 1. High-visibility plastic mesh fencing, minimum 4 feet high, orange or equivalent color.
- B. Tree Protection Signs
 - 1. Weather-resistant signage indicating "Tree Protection Zone – Keep Out" or similar.
- C. Trunk and Root Protection
 - 1. Burlap or approved tree wraps to protect trunks during clearing operations.
 - 2. Mulch or wood chips for root zone protection where required.
- D. Erosion Control

1. Silt fencing and straw wattles meeting local environmental standards.
- E. Herbicides
 1. Only approved herbicides applied by licensed applicators in accordance with manufacturer's instructions and local regulations.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Verify clearing limits and protected vegetation locations as per contract documents and site markings.
- B. Install tree protection fencing and signage around protected trees and vegetation prior to clearing operations.
- C. Conduct pre-clearing meeting with site personnel, arborist, and Owner's representative to review protection measures and safety protocols.
- D. Coordinate with utilities to locate and protect underground and overhead services.
- E. Implement erosion and sediment control measures before clearing begins.

3.2 SELECTIVE CLEARING PROCEDURES

- A. Remove only vegetation indicated for clearing on plans. Preserve designated trees, shrubs, and ground cover.
- B. Cut trees and shrubs cleanly at ground level or as otherwise indicated. Remove stumps only if specified.
- C. Use equipment and methods that minimize soil disturbance and damage to adjacent vegetation.
- D. Avoid operation of heavy equipment within root protection zones of preserved trees.
- E. Dispose of cleared vegetation promptly according to waste management plan. Recycle or reuse materials where possible.
- F. Apply herbicides only if approved and in accordance with manufacturer instructions and environmental regulations.

3.3 PROTECTION OF VEGETATION

- A. Maintain tree protection fencing and signage throughout clearing operations. Repair or replace damaged fencing immediately.
- B. Protect root zones of preserved trees by limiting soil compaction and disturbance. Use mulch or protective mats if equipment must pass near roots.
- C. Protect trunks with wraps or guards if mechanical injury is possible.
- D. Monitor health of preserved trees during and after clearing; notify Owner if damage occurs.

3.4 SITE RESTORATION

- A. Remove tree protection fencing and signage after clearing is complete and site is stabilized.
- B. Restore disturbed areas outside clearing limits as specified in related planting and site work sections.
- C. Dispose of all debris, including stumps and roots, in accordance with local regulations.
- D. Final grade clearing limits to prevent erosion and promote drainage.

3.5 CLEANING

- A. Remove all equipment, materials, and debris from the site at completion of clearing.
- B. Leave the site in a clean, safe, and orderly condition.

3.6 FIELD QUALITY CONTROL

- A. Arborist to inspect tree protection installations and clearing operations periodically.
- B. Correct any deficiencies related to tree protection or clearing methods immediately.
- C. Document inspections and corrective actions for Owner's records.

3.7 PROTECTION

- A. Protect site and adjacent properties from damage caused by clearing operations.
- B. Prevent unauthorized access to clearing areas with fencing and signage.
- C. Comply with all safety regulations including OSHA during clearing operations.

END OF SECTION

BUILDING FOR ROGERS FACILITIES DEPARTMENT
ROGERS, AR

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DEMX ARCHITECTURE
FAYETTEVILLE, AR

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes
- B. Stripping and removal of topsoil, vegetation, and unsuitable materials from designated areas.
- C. Excavation, handling, and stockpiling of earth materials for reuse or disposal.
- D. Protection and maintenance of stockpiled materials.
 - 1. Related Sections
 - 2. Section 31 00 00 – Earthwork
 - a) Section 31 23 00 – Excavation and Fill
 - b) Section 31 25 00 – Erosion and Sedimentation Controls
 - c) Section 31 20 00 – Earth Moving
 - d) Section 31 22 00 – Grading
 - e) Section 32 91 00 – Planting Soil and Soil Amendments
 - f) Section 01 35 29 – Health and Safety Procedures
 - g) Section 01 33 00 – Submittal Procedures
 - 3. Definitions
 - a) Earth Stripping: Removal of topsoil, vegetation, and unsuitable materials from the site surface.
 - b) Stockpiling: Temporary storage of stripped earth materials for reuse or disposal.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM)
- B. ASTM D2487 – Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
- C. ASTM D422 – Particle-Size Analysis of Soils
- D. ASTM D698 – Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³)
- E. ASTM D4318 – Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- F. ASTM D1556 – Density and Unit Weight of Soil in Place by the Sand-Cone Method
- G. Occupational Safety and Health Administration (OSHA) Standards
- H. OSHA 29 CFR 1926 – Safety and Health Regulations for Construction
- I. U.S. Environmental Protection Agency (EPA)
- J. EPA SW-846 – Test Methods for Evaluating Solid Waste, Physical/Chemical Methods
- K. American National Standards Institute (ANSI)
- L. ANSI A10.9 – Safety Requirements for Excavation Work
- M. International Code Council (ICC)
- N. International Building Code (IBC) 2021 Edition

- O. Local and State Regulations
- P. Comply with all applicable local and state environmental, safety, and construction codes and regulations.

1.3 SUBMITTALS

- A. Action Submittals
 - 1. Product Data: Include manufacturer's information on equipment used for stripping and stockpiling.
 - 2. Construction Schedule: Indicate timing and sequence of stripping and stockpiling operations.
 - 3. Method Statement: Detailed description of procedures for stripping, excavation, stockpiling, and protection of materials.
 - 4. Equipment List: Identification of equipment intended for use.
 - 5. Quality Control Plan: Procedures for soil classification, testing, and verification of material suitability.
 - 6. Erosion and Sediment Control Plan: Include measures to prevent erosion and sedimentation during stripping and stockpiling.
- B. Informational Submittals
 - 1. Soil Test Reports: Results of soil classification, contamination, and suitability analyses.
 - 2. Material Source Documentation: Documentation identifying sources of imported soils if used.
 - 3. Safety Plan: Health and safety procedures related to earth stripping and stockpiling operations.
 - 4. Environmental Protection Measures: Documentation of compliance with environmental permits and regulations.
 - 5. Photographic Documentation: Pre-stripping and post-stripping site conditions.

1.4 QUALITY ASSURANCE

- A. Qualifications
 - 1. Perform work by experienced personnel skilled in earth stripping and stockpiling operations.
 - 2. Contractor shall employ a qualified geotechnical engineer or soil specialist to oversee testing and classification.
- B. Testing and Inspection
 - 1. Soil samples shall be tested in accordance with ASTM standards referenced in 1.2.
 - 2. Verify soil moisture content and compaction characteristics to ensure suitability for reuse or disposal.
 - 3. Inspections shall be conducted to verify compliance with project requirements and environmental regulations.

C. Environmental Compliance

1. Comply with all erosion and sedimentation control requirements during stripping and stockpiling.
2. Maintain dust control measures to minimize airborne particulates.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery

1. Coordinate delivery of equipment and materials to minimize site congestion and disruption.

B. Storage

1. Stockpile stripped materials in designated areas as indicated on project drawings.
2. Protect stockpiles from contamination, erosion, and excessive moisture.
3. Maintain stockpile geometry to prevent instability and ensure ease of access.

C. Handling

1. Handle materials to prevent mixing of unsuitable materials with approved soils.
2. Prevent compaction or degradation of stockpiled materials by restricting heavy equipment movement over stockpiles.

1.6 WARRANTIES

- A. Provide warranty that stripped and stockpiled materials are free from contamination and meet project specifications for reuse.
- B. Warranty period shall be minimum one year from date of substantial completion.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Equipment Manufacturers (examples)

1. Caterpillar Inc.
2. John Deere
3. Komatsu Ltd.
4. Volvo Construction Equipment
5. Hitachi Construction Machinery

B. Material Suppliers

1. Local soil suppliers approved by project geotechnical engineer.
2. Suppliers of erosion control materials and soil amendments as specified in related sections.

2.2 MATERIALS

A. Stripped Topsoil

1. Free of roots, debris, stones over 2 inches in diameter, and other deleterious materials.
2. Suitable for reuse in landscaping, planting, or site restoration.
- B. Subsoil and Other Earth Materials
 1. Classified and tested according to ASTM D2487 and project geotechnical requirements.
 2. Free of organic matter and unsuitable contaminants.
- C. Erosion Control Materials
 - a) Mulch, geotextiles, silt fences, and other materials conforming to Section 31 25 00.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Verify site boundaries and stripping limits with project surveyor.
- B. Identify and mark protected areas and utilities prior to stripping.
- C. Install erosion and sediment control measures as required before beginning stripping operations.
- D. Conduct pre-stripping photographic documentation of existing site conditions.

3.2 EARTH STRIPPING

- A. Remove topsoil, vegetation, and unsuitable materials to depths and limits indicated on drawings or as directed by Engineer.
- B. Strip materials in a manner to prevent mixing of unsuitable soils with topsoil or stockpile materials.
- C. Do not strip when soils are frozen or excessively wet to avoid damage and contamination.
- D. Transport stripped materials promptly to designated stockpile areas.
- E. Maintain safe slopes and access routes during stripping operations.

3.3 STOCKPILING

- A. Locate stockpiles in designated areas with stable subgrade and adequate drainage.
- B. Construct stockpiles to a height not exceeding 10 feet unless otherwise approved.
- C. Shape stockpiles to promote drainage and minimize erosion.
- D. Protect stockpiles from contamination by debris, waste, or construction materials.
- E. Cover or stabilize stockpiles as required to control dust and erosion.
- F. Restrict equipment movement on stockpiles to prevent compaction and degradation.
- G. Maintain records of stockpile volumes, locations, and material characteristics.

3.4 TESTING AND ACCEPTANCE

- A. Sample stockpiled materials for classification and suitability testing in accordance with ASTM standards.
- B. Reject materials contaminated or unsuitable for reuse; remove from site or dispose of according to regulations.
- C. Engineer will perform periodic inspections of stripping and stockpiling operations to verify compliance.

3.5 CLEANUP

- A. Remove debris, unsuitable materials, and equipment from site upon completion of stripping and stockpiling.
- B. Restore disturbed areas outside stripping limits as directed.

3.6 PROTECTION

- A. Protect stripped and stockpiled materials from erosion, contamination, and compaction until reused or removed.
- B. Maintain erosion and sediment control devices during stockpiling phase.
- C. Monitor stockpiles regularly for signs of instability or environmental impact and take corrective action as necessary.

END OF SECTION

BUILDING FOR ROGERS FACILITIES DEPARTMENT
ROGERS, AR

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DEMX ARCHITECTURE
FAYETTEVILLE, AR

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include, but are not limited to:
 - 1. 31 23 00 - Excavation and Fill
 - 2. 31 23 16 - Excavation and Backfill for Utilities
 - 3. 31 25 00 - Erosion and Sedimentation Controls
 - 4. 32 91 00 - Planting Soil Preparation
 - 5. 31 05 19 - Geotechnical Exploration Reports
 - 6. 01 33 00 - Submittal Procedures
 - 7. 01 35 43 - Environmental Compliance
 - 8. 01 74 19 - Construction Waste Management and Disposal

1.2 SUMMARY

- A. This Section includes site grading including cutting, filling, leveling, and contouring for building pads, utilities, roadways, sidewalks, and landscaped areas.
- B. Related work specified elsewhere includes:
 - 1. Excavation and fill for utilities in Section 31 23 16.
 - 2. Erosion and sediment control in Section 31 25 00.
 - 3. Soil preparation and amendments in Section 32 91 00.

1.3 DEFINITIONS

- A. Grading: The process of reshaping the ground surface by cutting, filling, or leveling to the required lines, elevations, and slopes.
- B. Finish Grade: The final elevation and slope of the ground surface after grading is complete.
- C. Rough Grade: The initial shaping of the site prior to finish grading.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- A. Action Submittals:
 - 1. Grading Plan: Detailed plan indicating existing and proposed grades, contours, drainage patterns, and locations of cuts and fills.
 - 2. Soil Reports: Geotechnical reports including recommendations for grading, compaction, and fill materials.
 - 3. Equipment List: List of equipment proposed for grading operations.
 - 4. Mix Designs: For any engineered fill or soil stabilization materials.

5. Erosion and Sediment Control Plan demonstrating compliance with applicable environmental regulations.
- B. Informational Submittals:
1. Field Quality Control Reports including compaction test results.
 2. Material Certificates for fill materials.
 3. Manufacturer's product data for any soil stabilization or erosion control products used.

1.5 QUALITY ASSURANCE

- A. Perform grading in accordance with accepted industry standards including ASTM and local building codes.
- B. Compaction Testing:
1. Engage an independent testing agency to perform field density tests at frequencies required by the geotechnical engineer and local authorities.
 2. Tests shall comply with ASTM D1556, ASTM D698, ASTM D2922, or ASTM D6938 as applicable.
- C. Personnel Qualifications:
1. Contractor shall employ personnel with minimum 5 years' experience in site grading and earthwork operations.
 2. Operator certification for heavy equipment shall be current and verifiable.
- D. Compliance with Codes and Standards:
1. Comply with applicable federal, state, and local regulations including OSHA safety standards related to earthwork operations.
 2. Comply with stormwater management and erosion control requirements as per EPA and local jurisdictional authorities.
- E. Mock-Up:
1. When requested by the Architect/Engineer, provide a mock-up area to demonstrate grading techniques and finish quality.

1.6 STORAGE AND HANDLING

- A. Store fill materials in designated areas protected from contamination, erosion, and loss by wind or water.
- B. Protect excavated materials from moisture changes and contamination.
- C. Handle all materials to prevent segregation, contamination, or damage.
- D. Equipment used for grading shall be maintained in good working condition to prevent leaks or spills of fuel, oil, or hydraulic fluids.
- E. Store erosion control materials and equipment on-site in dry, accessible locations.

1.7 WARRANTY

- A. Provide a warranty for grading work that guarantees the work will remain stable and free from erosion, settling, or other defects for a minimum period of one year from date of final acceptance.
- B. Warranty shall include repair or replacement of any areas showing failure or nonconformance to specified grades.
- C. Provide manufacturer warranties for soil stabilization or erosion control products as applicable.

1.8 APPLICABLE CODES, STANDARDS, AND REFERENCES

- A. Codes:
 - 1. International Building Code (IBC), latest edition.
 - 2. Occupational Safety and Health Administration (OSHA) Standards, 29 CFR Part 1926 – Construction.
 - 3. Local Building and Zoning Codes.
 - 4. Clean Water Act, Section 402 NPDES Stormwater Program.
- B. Standards:
 - 1. ASTM International:
 - a) ASTM D1556 – Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
 - b) ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.
 - c) ASTM D2922 – Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 - d) ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Depth Moisture Gauge).
 - e) ASTM D2487 – Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
 - f) ASTM D4318 – Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
 - 2. USDA Natural Resources Conservation Service (NRCS) Soil Survey and Classification Guidelines.
- C. References:
 - 1. “Earthwork and Grading Handbook,” Nick Capachi, McGraw Hill, latest edition.
 - 2. “Site Engineering for Landscape Architects,” Steven Strom, Kurt Nathan, Jake Woland.
 - 3. Local Geotechnical Engineering Reports.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Fill Material:
 - 1. Shall be free of organic matter, debris, frozen material, trash, and other deleterious substances.
 - 2. Shall meet gradation and compaction requirements as specified in the geotechnical report or as approved by the Engineer.
 - 3. Shall have plasticity index and liquid limit within acceptable ranges to ensure stability and compaction.
- B. Topsoil:
 - 1. Shall be fertile, friable natural loam free of subsoil, clay lumps, stones over 1 inch, roots, sticks, and other foreign matter.
 - 2. Shall meet requirements specified in Section 32 91 00.
- C. Soil Stabilization Products (if applicable):
 - 1. Chemical stabilizers, geotextiles, or other additives shall be compatible with site conditions and meet manufacturer's recommendations.
 - 2. Shall comply with environmental regulations.
- D. Erosion Control Materials:
 - 1. Mulches, mats, blankets, and other devices shall conform to Section 31 25 00.
- E. Water:
 - 1. Potable water free of impurities harmful to soil stabilization or vegetation.

2.2 EQUIPMENT

- A. Use heavy equipment suitable for grading operations including but not limited to bulldozers, graders, scrapers, compactors, and water trucks.
- B. Equipment shall be maintained in good working order and free of leaks.

2.3 MANUFACTURERS

- A. 2.3.1 Soil Stabilizers and Additives:
 - 1. TerraSystems, Inc.
 - 2. Soilworks, LLC
 - 3. BASF Corporation
 - 4. Sika Corporation
- B. 2.3.2 Erosion Control Products:
 - 1. North American Green
 - 2. Profile Products LLC
 - 3. Western Excelsior
- C. 2.3.3 Testing and Compaction Equipment:
 - 1. Troxler Electronic Laboratories
 - 2. Humboldt Mfg. Co.
- D. 2.3.4 Heavy Equipment:
 - 1. Caterpillar Inc.
 - 2. John Deere

3. Komatsu America Corp.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that existing site conditions, including grades, drainage patterns, and utilities, conform to requirements.
- B. Review geotechnical reports and recommendations.
- C. Notify Architect/Engineer of any discrepancies or conditions detrimental to proper execution of grading.
- D. Do not proceed with grading until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect existing structures, utilities, vegetation, and improvements designated to remain.
- B. Remove debris, vegetation, and unsuitable materials from areas to be graded.
- C. Establish erosion and sediment control measures prior to grading operations.
- D. Identify and mark limits of grading and stockpile locations.

3.3 GRADING

- A. General Requirements:
 1. Perform grading to lines, elevations, and slopes indicated on the Drawings.
 2. Maintain grades to ensure positive drainage away from structures and utilities.
 3. Avoid over-excavation; fill and compact as required to achieve design elevations.
 4. Do not place fill or compact when moisture content is unsuitable.
- B. Rough Grading:
 1. Cut and fill to approximate grades to facilitate drainage and installation of utilities.
 2. Scarify subgrade where required to enhance bonding of fill material.
- C. 3.3.3 Fill Placement and Compaction:
 1. Place fill in layers not exceeding 8 inches loose thickness.
 2. Compact each layer to minimum 95% of maximum dry density as determined by ASTM D698 or as specified by the geotechnical engineer.
 3. Moisture content of fill material shall be maintained within +/- 2% of optimum moisture content.
- D. 3.3.4 Finish Grading:
 1. Fine grade areas to final elevations and slopes, providing smooth and even surfaces.
 2. Remove irregularities, depressions, or humps.
- E. 3.3.5 Tolerances:
 1. Finish grade elevations shall be within +/- 0.05 feet of indicated elevations.

2. Slopes shall be within 2 percent of specified gradients.

3.4 FIELD QUALITY CONTROL

- A. Compaction Testing:
 1. Perform density tests at locations and frequency as required by the geotechnical engineer and governing authorities.
 2. Provide copies of test reports to Architect/Engineer promptly.
 3. Areas failing to meet compaction requirements shall be reworked and retested.
- B. Observation and Verification:
 1. Testing agency shall observe fill placement, moisture conditioning, and compaction operations.
- C. Correct deficiencies immediately upon discovery.

3.5 PROTECTION

- A. Protect finished grading from traffic, erosion, and weather damage until subsequent construction or landscaping.
- B. Repair settlement, erosion, or other damage to finished grading at no cost to Owner.
- C. Maintain erosion and sediment controls until permanent vegetation or other stabilization measures are established.

3.6 CLEANING

- A. Remove surplus materials, debris, and equipment from site.
- B. Leave site clean and ready for subsequent construction activities.

END OF SECTION

PART 1 – GENERAL

1.1 RELATED SECTIONS

- A. Section 31 20 00 - Earth Moving
- B. Section 31 05 16 - Geotextiles
- C. Section 31 00 00 - Site Clearing
- D. Section 32 11 23 - Aggregate Base Courses
- E. Section 31 25 00 - Erosion and Sediment Control
- F. Section 31 23 16 - Excavation and Backfill for Utility Trenches
- G. Section 31 23 23 - Structural Fill
- H. Section 01 33 00 - Submittal Procedures
- I. Section 01 45 00 - Quality Control
- J. Section 01 74 19 - Construction Waste Management and Disposal

1.2 APPLICABLE REFERENCES, STANDARDS, AND CODES

- A. American Society for Testing and Materials (ASTM)
 - a) ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort
 - b) ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
 - c) ASTM D2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
 - d) ASTM D2216 - Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
 - e) ASTM D4253 - Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
 - f) ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
 - g) ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
- B. Occupational Safety and Health Administration (OSHA)
 - a) OSHA 29 CFR Part 1926 - Safety and Health Regulations for Construction
- C. American Association of State Highway and Transportation Officials (AASHTO)
 - 1. AASHTO T99 - Moisture-Density Relations of Soils Using a 5.5-lb Rammer and a 12-in. Drop
 - 2. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-lb Rammer and an 18-in. Drop
- D. International Building Code (IBC)
- E. Local Building Codes and Regulations

1.3 QUALITY ASSURANCE

A. Qualifications

1. Excavation and fill work shall be performed by a firm experienced in excavation and fill operations of similar scope and complexity.
2. Provide qualifications of personnel and equipment upon request.

B. Testing and Inspection

1. Engage a qualified geotechnical testing laboratory to perform soil classification, moisture content, density, and compaction testing.
2. Testing frequency shall comply with project requirements and applicable standards or as directed by the Engineer.
3. Field density tests shall be performed at a minimum frequency of one test per 500 square yards per lift or as specified.

C. Compliance

1. All excavation and fill operations shall comply with OSHA safety regulations for excavation and trenching.
2. Verify utility locations prior to excavation.
3. Maintain alignment, grades, and elevations within tolerances specified by the Engineer.

1.4 SUBMITTALS

A. Action Submittals

1. Excavation and Fill Plan including sequence, methods, equipment, and temporary support measures.
2. Material submittals for fill material including source, gradation, and test reports.
3. Equipment list proposed for excavation, hauling, and compaction.
4. Quality control plan including testing frequency and methods.
5. Manufacturer's data for geotextiles or additives incorporated in fill materials.

B. Informational Submittals

1. Soil test reports including classification, moisture content, and compaction characteristics.
2. Records of field density and moisture tests.
3. Reports of non-conformance and corrective actions.
4. Project schedule updates related to excavation and fill operations.
5. Health and safety plan related to excavation activities.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery

- a) Deliver fill materials in a manner to prevent contamination and segregation.

B. Storage

1. Store fill materials on-site in designated areas to prevent mixing with foreign materials.
 2. Protect stockpiles from erosion and contamination by water, debris, and other materials.
- C. Handling
1. Handle fill materials to avoid segregation and contamination.
 2. Maintain moisture content of fill materials within limits required for proper compaction.

1.6 WARRANTIES

- A. Provide a warranty for fill compaction and stability for a period of one year from date of final acceptance.
- B. Warranty shall cover settlement, erosion, and compaction failure requiring remedial action.
- C. Submit warranty documentation signed by Contractor and geotechnical engineer or testing agency.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Excavation Materials
 1. Remove unsuitable materials including organic matter, debris, frozen soil, and unstable soils as directed.
- B. Fill Materials
 1. Granular Fill: Clean, well-graded sand, gravel, or crushed stone free of organic material and deleterious substances.
 2. Structural Fill: Engineered fill meeting project gradation and compaction requirements per geotechnical recommendations.
 3. Select Fill: Free from rocks larger than 2 inches, debris, and foreign matter, with plasticity index less than 15.
- C. Geotextiles and Additives
 1. Provide geotextiles for separation or stabilization as specified and per Section 31 05 16.
 2. Additives such as lime or cement for soil stabilization shall comply with project specifications and standards.

2.2 MANUFACTURERS

- A. Fill Material Suppliers
 1. Lehigh Hanson Inc.
 2. Vulcan Materials Company

3. Martin Marietta Materials
4. CEMEX Inc.
- B. Geotextile Manufacturers
 1. TenCate Geosynthetics
 2. Huesker Inc.
 3. Mirafi (Part of TenCate)
- C. Testing and Inspection Agencies
 1. Local certified geotechnical laboratories approved by the Engineer.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify site conditions and limits of excavation prior to starting work.
- B. Confirm that utilities have been located and protected or removed as necessary.
- C. Notify Engineer of any discrepancies, unsuitable soil conditions, or obstructions.

3.2 PREPARATION

- A. Clear and grub excavation areas of vegetation, debris, and unsuitable materials.
- B. Strip topsoil and stockpile separately for reuse or disposal.
- C. Provide erosion and sediment control measures as specified.

3.3 EXCAVATION

- A. Excavate to lines, grades, and elevations indicated on drawings or as directed.
- B. Remove unsuitable or unstable materials to the depth directed.
- C. Perform excavation using equipment suitable to maintain accuracy and minimize disturbance.
- D. Maintain excavation slopes and shoring in compliance with OSHA requirements.
- E. Remove water from excavations to maintain dry working conditions.

3.4 FILLING AND BACKFILLING

- A. Place fill materials in layers not exceeding 8 inches loose thickness.
- B. Maintain moisture content of fill material within optimum range for compaction.
- C. Compact each layer to not less than 95 percent of maximum dry density per ASTM D698 or project-specific criteria.
- D. Use mechanical compaction equipment suitable for soil type and layer thickness.
- E. Scarify existing surfaces to receive new fill to promote bonding.
- F. Do not place fill on frozen or muddy surfaces.

3.5 FIELD QUALITY CONTROL

A. Testing

1. Perform field density tests using sand cone, nuclear gauge, or other approved methods.
2. Test frequency: minimum one test per 500 square yards per lift or as directed.
3. Perform moisture content tests in conjunction with density tests.

B. Corrective Measures

1. Remove and replace or re-compact areas failing to meet compaction requirements.
2. Document all corrective actions and retesting.

3.6 PROTECTION

- A. Protect completed fill from erosion, disturbance, and damage.
- B. Maintain drainage to prevent water accumulation on fill areas.
- C. settlement, erosion, or damage at no cost to the Owner during warranty period.

3.7 CLEANING

- A. Remove excess materials, debris, and equipment from site upon completion.
- B. Restore adjacent areas disturbed by excavation and fill operations.

END OF SECTION 31 23 00

BUILDING FOR ROGERS FACILITIES DEPARTMENT
ROGERS, AR

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DEMX ARCHITECTURE
FAYETTEVILLE, AR

PART 1 – GENERAL

1.1 RELATED SECTIONS

- A. Section 01 33 00 – Submittal Procedures
- B. Section 01 45 00 – Quality Control
- C. Section 31 10 00 – Site Clearing
- D. Section 31 20 00 – Earth Moving
- E. Section 33 46 00 – Subdrainage
- F. Section 33 11 00 – Water Utilities
- G. Section 33 11 16 – Pumping and Pump Stations
- H. Section 32 90 00 – Planting
- I. Section 01 78 00 – Closeout Submittals

1.2 REFERENCES, CODES, AND STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
 - 2. ASTM D5092 – Standard Specification for Rubber Gasket Joints for Drain and Sewer Plastic Pipes
- B. American National Standards Institute (ANSI)
 - 1. ANSI/ASME A112.6.3 – Gravity Sanitary Drainage Systems
- C. Occupational Safety and Health Administration (OSHA)
 - 1. OSHA 29 CFR 1926 – Safety and Health Regulations for Construction
- D. International Code Council (ICC)
 - 1. International Building Code (IBC)
 - 2. International Plumbing Code (IPC)
- E. National Fire Protection Association (NFPA)
 - 1. NFPA 70 – National Electrical Code (NEC)
- F. American Water Works Association (AWWA)
 - 1. AWWA C600 – Installation of Ductile-Iron Water Mains and Their Appurtenances
- G. U.S. Environmental Protection Agency (EPA)
 - 1. EPA Stormwater Management Best Practices
- H. Manufacturer standards and installation instructions

1.3 DEFINITIONS

- A. Dewatering: The process of removing and controlling groundwater and surface water from construction excavations and sites to provide a dry and stable work area.

- B. Pumping System: Equipment used for removing water, including pumps, piping, and discharge systems.
- C. Wellpoints: Small-diameter suction wells connected to a header pipe and vacuum pumps used for lowering groundwater levels.
- D. Sump: A low point excavation or pit where water collects for pumping out.

1.4 SUBMITTALS

A. Action Submittals

- 1. Dewatering Plan: Detailed description of dewatering methods, equipment, sequence, and expected impacts on site and adjacent properties.
- 2. Equipment Data: Manufacturer's specifications, performance curves, and capacities for pumps, wellpoints, and related equipment.
- 3. Pumping System Layout Drawings: Locations of sumps, pumps, discharge lines, and monitoring points.
- 4. Monitoring Plan: Methods and frequency for measuring groundwater levels and water quality.
- 5. Schedule: Dewatering system installation, operation, and removal schedule aligned with construction sequencing.
- 6. Safety Plan: Procedures and measures for worker safety related to dewatering operations, including confined space entry if applicable.

B. Informational Submittals

- 1. Records of field tests and monitoring data.
- 2. Maintenance and operation manuals.
- 3. Copies of permits and approvals related to dewatering activities.
- 4. Photographic documentation of pre-construction site conditions and dewatering setup.

1.5 QUALITY ASSURANCE

A. Qualifications

- 1. Dewatering Contractor shall have a minimum of five years' experience successfully performing dewatering operations similar in scope and complexity.
- 2. All equipment shall be certified by manufacturers and comply with applicable ANSI and ASTM standards.

B. Testing and Monitoring

- 1. Dewatering system shall be monitored continuously during operation to ensure groundwater lowering meets design criteria without adverse effects on adjacent structures or environment.
- 2. Provide instrumentation for groundwater level monitoring, including piezometers or observation wells as directed.

C. Compliance

- 1. Comply with all applicable federal, state, and local environmental regulations, including discharge permits and stormwater management requirements.

2. Implement dust control and erosion prevention measures during dewatering.
- D. Safety
1. Follow OSHA requirements for excavation safety, electrical safety, and confined space entry.
 2. Provide appropriate personal protective equipment (PPE) and training for personnel.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver equipment and materials in manufacturer's original packaging with labels and instructions intact.
- B. Store pumps, pipes, hoses, and accessories in dry, protected areas to prevent damage and contamination.
- C. Handle equipment carefully to avoid impact or deformation; use appropriate lifting devices and techniques.
- D. Protect electrical components and controls from moisture and physical damage during storage and installation.
- E. Maintain storage records and inspection logs to ensure material integrity prior to installation.

1.7 WARRANTY

- A. Provide a minimum one-year warranty from date of substantial completion covering defects in materials and workmanship of dewatering system components.
- B. Warranty shall include prompt repair or replacement of defective equipment and correction of installation deficiencies.
- C. Submit written warranty documents prior to final acceptance.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Submersible Pumps:
 1. Flygt (Xylem Inc.)
 2. Grundfos
 3. Tsurumi Manufacturing Co., Ltd.
- B. Wellpoint Systems:
 1. Layne Christensen Company
 2. Maccaferri Environmental Solutions
- C. Pump Controls and Accessories:
 1. Siemens Industry, Inc.
 2. Allen-Bradley (Rockwell Automation)
- D. Piping and Hose:

1. JM Eagle (Thermoplastic piping)
 2. Continental Girbau (Flexible hose)
- E. Monitoring Equipment:
1. Solinst Canada Ltd. (Piezometers and Level Loggers)
 2. In-Situ, Inc.

2.2 PUMPS

- A. Submersible pumps shall be suitable for continuous operation, with stainless steel or corrosion-resistant housing and impellers.
- B. Pumps shall have automatic level controls or float switches to prevent dry running.
- C. Capacity and head shall meet or exceed the design requirements specified in the Dewatering Plan.
- D. Electrical motors shall comply with NFPA 70 and be suitable for wet or submerged applications.

2.3 WELLPOINT SYSTEMS

- A. Wellpoints shall be constructed of corrosion-resistant materials with screened intake sections to prevent clogging.
- B. Header piping shall be sized to provide uniform vacuum and flow distribution.
- C. Vacuum pumps shall be sized to maintain required groundwater lowering with redundancy for continuous operation.

2.4 PIPING AND HOSES

- A. Discharge piping shall be durable, flexible or rigid as required, resistant to abrasion, and capable of handling expected flow rates and pressures.
- B. Connections shall be watertight, with fittings and joints complying with ASTM standards.
- C. Provide backflow prevention where required by local codes.

2.5 CONTROLS AND MONITORING EQUIPMENT

- A. Automatic control panels shall allow for start/stop operation, alarm indications, and remote monitoring capability.
- B. Groundwater monitoring instruments shall be accurate to within 0.01 feet and capable of continuous data logging.
- C. Provide weatherproof enclosures for all electrical components.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify site conditions, including groundwater levels, soil type, and existing utilities prior to installation.
- B. Notify Architect/Engineer of any conditions detrimental to proper dewatering system performance.
- C. Confirm that all required permits and approvals have been obtained.

3.2 PREPARATION

Install erosion and sediment control measures to prevent off-site discharge of pumped water. Establish access routes and staging areas for equipment installation and maintenance. Mark locations of all wellpoints, sumps, and discharge lines as per approved submittals.

3.3 INSTALLATION

- A. Install wellpoints, pumps, piping, and controls in accordance with manufacturer instructions and approved Dewatering Plan.
- B. Ensure all electrical connections comply with NEC requirements and are performed by qualified personnel.
- C. Provide adequate anchoring and support for piping and equipment to prevent movement during operation.
- D. Conduct initial testing of pumps and control systems to verify operation prior to dewatering commencement.

3.4 OPERATION

- A. Operate dewatering system continuously as required to maintain excavation and site dry and stable.
- B. Monitor groundwater levels and system performance daily, adjusting operation as necessary.
- C. Maintain logs of operating parameters, maintenance activities, and monitoring data.
- D. Implement immediate corrective actions in case of system failure or deviation from design criteria.

3.5 MAINTENANCE

- A. Perform routine inspection and maintenance of pumps, hoses, and controls to ensure reliable operation.
- B. Clean strainers, check valves, and screens regularly to prevent clogging.
- C. Replace damaged or worn components promptly.
- D. Maintain clear access to all equipment for inspection and repair.

3.6 SYSTEM REMOVAL AND SITE RESTORATION

- A. Remove all dewatering equipment, piping, and temporary structures upon completion of excavation or as directed.
- B. Restore disturbed areas to original or specified conditions, including grading and erosion control measures.
- C. Dispose of water and sediment in compliance with environmental regulations and permit conditions.
- D. Submit final dewatering system removal report documenting system performance and site conditions.

3.7 PROTECTION

- A. Protect adjacent structures, utilities, and natural features from adverse effects of dewatering operations.
- B. Monitor for potential settlement or destabilization and report immediately any observed damages.
- C. Maintain barriers and signage to prevent unauthorized access to dewatering equipment and excavations.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

- A. Section 31 23 16 – Excavation and Fill
- B. Section 31 23 23 – Trenching, Backfilling, and Compacting for Utilities
- C. Section 31 23 26 – Trenching and Backfilling for Pipelines
- D. Section 31 05 16 – Aggregate Subbase
- E. Section 31 20 00 – Earth Moving
- F. Section 33 05 13 – Utility Structures
- G. Section 31 23 00 – Excavation and Backfilling for Structures
- H. Section 01 33 00 – Submittal Procedures
- I. Section 01 45 00 – Quality Control

1.2 REFERENCES, CODES, AND STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM D1556 – Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
 - 2. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort
 - 3. ASTM D2167 – Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
 - 4. ASTM D2922 – Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods
 - 5. ASTM D4318 – Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
 - 6. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort
 - 7. ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods
- B. Occupational Safety and Health Administration (OSHA)
 - 1. OSHA 29 CFR 1926 Subpart P – Excavations
- C. American Public Works Association (APWA)
 - 1. APWA Standard Specifications for Public Works Construction
- D. National Fire Protection Association (NFPA)
 - 1. NFPA 70 – National Electrical Code (for trenching near electrical installations)
- E. International Code Council (ICC)
 - 1. International Building Code (IBC), latest edition
- F. Local, State, and Federal Codes
 - 1. All applicable local municipal codes and ordinances for excavation, trenching, and backfilling operations

G. U.S. Green Building Council (USGBC)

H. Other Industry Standards

1. Manual on Uniform Traffic Control Devices (MUTCD) for work zone safety

1.3 DEFINITIONS

- A. Trench: A narrow excavation made below the surface of the ground, usually deeper than it is wide, to install utilities or other infrastructure.
- B. Backfill: Material used to refill an excavation or trench after installation of utilities or structures.
- C. Bedding: The layer of material placed in the trench bottom to provide a stable base for pipes or structures.
- D. Compaction: The process of densifying soil or backfill material to reduce voids and increase strength.

1.4 QUALITY ASSURANCE

- A. Contractor Qualifications:
 - 1. Contractor shall have a minimum of five (5) years documented experience in trenching and backfilling similar in scope and complexity.
 - 2. Contractor shall maintain compliance with OSHA excavation and trenching safety requirements.
- B. Testing Laboratory:
 - 1. Engage an independent testing laboratory to perform soil compaction and moisture content tests in accordance with ASTM standards specified.
- C. Inspection and Testing:
 - 1. Soil classification, moisture content, and compaction density shall be verified and documented prior to backfilling.
 - 2. Compaction tests shall be performed at intervals not less than one test per 500 square feet or per 100 linear feet of trench, whichever is greater.
 - 3. Testing frequency and methods shall comply with ASTM standards D1556, D2922, and D6938.
- D. Safety:
 - 1. Comply with OSHA 29 CFR 1926 Subpart P for excavation and trench safety, including protective systems such as shoring, shielding, or sloping.
 - 2. Provide traffic control measures per MUTCD standards where trenching impacts public roadways or pedestrian paths.

1.5 SUBMITTALS

- 1. Action Submittals:
 - a. Product Data: Submit manufacturer's data on bedding and backfill materials including gradation, physical properties, and compaction characteristics.

- b. Project-Specific Soil Report: Submit geotechnical report including soil classification and recommendations for trenching and backfill.
 - c. Work Plan: Submit detailed trenching and backfilling sequence and safety plan including shoring methods and traffic control.
 - d. Testing Plan: Submit proposed schedule and methods for compaction and density testing.
- 2. Informational Submittals:
 - a. Test Reports: Submit compaction and density test results with location, date, and compliance verification.
 - b. Safety Documentation: Submit OSHA trenching safety compliance records and inspection logs.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery:
 - a. Deliver bedding and backfill materials in dry, clean condition free from contamination, organic matter, or frozen lumps.
 - b. Deliver materials in quantities to prevent delay and excessive stockpiling on site.
- B. Storage:
 - a. Store materials on-site in designated areas protected from weather, contamination, and segregation.
 - b. Segregate different types of materials to prevent mixing and contamination.
- C. Handling:
 - a. Handle materials to prevent contamination or degradation.
 - b. Avoid mixing of materials during transport and placement.
 - c. Use equipment suitable for trenching and backfilling operations to minimize damage to installed utilities and structures.

1.7 WARRANTIES

- A. Contractor shall warrant trenching and backfilling work against defective workmanship and materials for a period of one (1) year from date of Substantial Completion.
- B. Warranty shall include repair or replacement of settled backfill areas, improperly compacted zones, or other defects resulting from trenching and backfilling operations.
- C. Provide manufacturer's warranty for any proprietary backfill or bedding materials incorporated, if applicable.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Bedding Material:

1. Clean, uniformly graded sand or granular material conforming to ASTM C33 or project-specific gradation requirements.
 2. Particle size distribution shall ensure proper pipe support and prevent pipe movement.
- B. Backfill Material:
1. Select suitable native soil free from organic material, debris, frozen lumps, and rocks larger than 2 inches unless otherwise specified.
 2. Imported backfill shall meet project gradation and compaction requirements, conforming to ASTM D2487 classifications SC, SM, or GW as applicable.
 3. Controlled low-strength material (flowable fill) may be used in specified trench zones as directed.
- C. Controlled Low-Strength Material (CLSM):
1. CLSM shall be a flowable, self-compacting mixture of cement, fly ash, sand, and water with compressive strength between 50 and 150 psi.
 2. Mix design must be submitted for approval prior to use.
- D. Geotextiles and Filters:
1. Use non-woven geotextiles for separation and filtration where indicated.
 2. Conform to ASTM D3786 and project-specific strength and permeability requirements.

2.2 MANUFACTURERS

- A. Bedding and Backfill Materials Suppliers:
1. Vulcan Materials Company
 2. Martin Marietta Materials
 3. CEMEX Inc.
 4. LafargeHolcim
 5. Local approved aggregate producers meeting specification requirements
- B. Controlled Low-Strength Material (CLSM) Providers:
1. US Concrete
 2. Oldcastle Materials
 3. Holcim (US) Inc.
- C. Geotextile Manufacturers:
1. TenCate Geosynthetics
 2. Huesker, Inc.
 3. Propex Operating Company, LLC
 4. Nilex Inc.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify trench dimensions and alignment comply with contract drawings and specifications before excavation.
- B. Inspect site conditions, including existing utilities and obstructions, and verify location and depth.
- C. Confirm soil conditions and moisture content are suitable for trenching and backfilling.
- D. Notify Architect/Engineer of unsatisfactory conditions prior to proceeding.

3.2 PREPARATION

- A. Locate and protect existing utilities and structures adjacent to trenching activities.
- B. Establish traffic control and safety barriers per MUTCD and OSHA requirements.

3.3 TRENCH EXCAVATION

- A. Excavate trenches to required depth, width, and alignment to accommodate utilities and bedding materials.
- B. Excavation shall be performed in accordance with OSHA protective system requirements to ensure worker safety.
- C. Remove unsuitable or unstable material encountered in the trench bottom and replace with approved bedding or structural fill.
- D. Maintain trench bottom in a smooth, uniform plane to provide continuous support.

3.4 BEDDING INSTALLATION

- A. Place bedding material in trench bottom to minimum thickness specified or as recommended by Engineer.
- B. Compact bedding material lightly to provide uniform support without damaging utilities.
- C. Maintain moisture content of bedding material within 2% of optimum moisture for compaction.

3.5 UTILITY INSTALLATION

- A. Install utility pipes, conduits, or structures in trench in accordance with manufacturers' recommendations and project drawings.
- B. Verify invert elevations and alignment prior to backfilling.
- C. Protect installed utilities from damage during backfilling operations.

3.6 BACKFILLING

- A. Backfill trenches with approved material placed in layers not exceeding 8 inches loose thickness.
- B. Compact each layer to at least 95% of maximum dry density as determined by ASTM D698 or project-specific compaction criteria.

- C. Maintain moisture content within 2% of optimum for compaction for each lift.
- D. Do not operate heavy equipment directly on freshly backfilled trenches until adequate compaction and curing have been achieved.
- E. Where specified, use CLSM in lieu of conventional backfill and allow curing to required strength before load application.
- F. Install geotextile separators or filters as indicated or directed.

3.7 FIELD QUALITY CONTROL

- A. Perform in-place density testing at frequencies specified in Part 1.4.3.
- B. Re-compact or replace backfill material failing to meet compaction or moisture requirements.
- C. Document all testing results and corrective actions.

3.8 PROTECTION

- A. Protect completed trench backfill from erosion, settlement, or damage until final surface restoration.
- B. Maintain erosion control measures throughout construction period.
- C. Repair or replace any damaged backfill or surfaces caused by settlement or construction activity.

3.9 CLEANING

- A. Remove excess materials, debris, and equipment from trenching and backfilling operations.
- B. Leave site in a neat and orderly condition.

END OF SECTION 31 23 33

PART 1 – GENERAL

1.1 RELATED SECTIONS

- A. Division 01 – General Requirements
- B. 31 10 00 – Site Clearing
- C. 31 20 00 – Earth Moving
- D. 31 23 00 – Excavation and Fill
- E. 32 90 00 – Planting
- F. 32 92 00 – Lawns and Grasses
- G. 32 93 00 – Plants
- H. 33 05 00 – Common Work Results for Utilities (for site drainage controls)
- I. 33 10 00 – Water Utilities
- J. 31 25 13 – Silt Fence
- K. 31 25 16 – Straw Bale Barriers
- L. 31 25 19 – Sediment Basins and Traps

1.2 REFERENCES, CODES, AND STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 1. 1.2.1.1 ASTM D6462 – Standard Practice for Installation of Turf Reinforcement Mats
 - 2. 1.2.1.2 ASTM D5141 – Standard Guide for Sampling and Testing Silt Fence Materials
 - 3. 1.2.1.3 ASTM D5035 – Standard Test Method for Breaking Force and Elongation of Textile Fabrics
- B. U.S. Environmental Protection Agency (EPA)
 - 1. 1.2.2.1 EPA Construction General Permit (CGP)
 - 2. 1.2.2.2 EPA Stormwater Management Best Practices
- C. Federal Highway Administration (FHWA)
 - 1. 1.2.3.1 FHWA Hydraulic Engineering Circular No. 22 (HEC-22) – Erosion Control
- D. U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS)
 - 1. 1.2.4.1 NRCS Conservation Practice Standards – Critical Area Planting (342), Sediment Basin (350)
- E. International Code Council (ICC)
 - 1. 1.2.5.1 International Building Code (IBC) – Site Safety and Environmental Controls
- F. State and Local Codes and Regulations – Comply with all applicable local erosion and sediment control ordinances and permits.
- G. Sedimentation Control Requirements
- H. Occupational Safety and Health Administration (OSHA) Standards – Safety related to erosion control installation

1.3 DEFINITIONS

- A. Erosion Control – Measures used to prevent soil particles from being detached and transported by wind or water.
- B. Sedimentation Control – Practices to prevent eroded soil from leaving the project site and entering water bodies or stormwater systems.

- C. Temporary Controls – Erosion and sedimentation control measures implemented during construction activities and removed or replaced after site stabilization.
- D. Permanent Controls – Measures installed for long-term soil stabilization and sediment control after construction completion.

1.4 ACTION SUBMITTALS

- A. Product Data – Submit manufacturer’s technical data, installation instructions, and material safety data sheets (MSDS) for each erosion and sedimentation control product.
- B. Erosion and Sediment Control Plan – Submit a detailed plan including type, location, installation details, and maintenance procedures for all temporary and permanent controls.
- C. Construction Schedule – Submit a schedule indicating timing of erosion and sedimentation control installation relative to earthwork activities.
- D. Samples – Submit physical samples of key erosion control materials such as silt fence fabric, erosion control blankets, and sediment logs for approval prior to installation.
- E. Certificates – Submit certification of compliance with applicable standards for manufactured erosion control products.

1.5 INFORMATIONAL SUBMITTALS

- A. Inspection Reports – Submit reports from erosion and sediment control inspections performed during construction.
- B. Maintenance Logs – Submit logs documenting maintenance and repair activities for erosion and sedimentation controls.
- C. Qualifications – Submit qualifications of personnel responsible for installation and inspection of erosion and sedimentation controls.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications – Engage experienced installers with a minimum of three years’ experience in erosion and sedimentation control systems similar in scope and complexity.
- B. Regulatory Compliance – Comply with requirements of federal, state, and local regulatory agencies having jurisdiction over erosion and sedimentation control.
- C. Inspection and Testing – Conduct inspections at intervals not exceeding seven calendar days and within 24 hours after any storm event of 0.25 inches or greater, documenting condition and performance of controls.
- D. Material Compliance – Use only materials meeting the requirements of referenced standards and approved submittals.
- E. Environmental Protection – Implement controls to prevent off-site sedimentation and protect water quality per EPA CGP and local permit conditions.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Delivery – Deliver erosion and sediment control materials in original, unopened packages or containers bearing manufacturer’s name, product identification, and batch number.
- B. Storage – Store materials in a clean, dry location protected from exposure to sunlight, moisture, and contaminants.

- C. Handling – Handle materials to prevent damage; avoid dragging or dropping materials. Protect fabric and blankets from tearing, punctures, or deterioration during installation.
- D. Stockpile Management – Stockpile soil and erosion control materials away from drainage courses and protected by temporary controls to prevent sediment runoff.

1.9 WARRANTY

- A. Manufacturer’s Warranty – Provide manufacturer’s standard warranty for erosion control products against defects in materials and workmanship for a minimum period of one year from date of installation.
- B. Installer’s Warranty – Installer shall warrant that erosion and sedimentation controls have been installed in accordance with manufacturer’s instructions, project specifications, and approved plans for a minimum period of one year from date of acceptance.
- C. Corrective Action – Promptly repair or replace erosion and sediment control measures found defective or failing within warranty period at no cost to the Owner.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Silt Fence and Sediment Control Products:
 - 1. Tenax Corporation
 - 2. North American Green, LLC
 - 3. Stormwater Management, Inc.
 - 4. Filtrexx International LLC
 - 5. Mirafi (TenCate)
- B. Erosion Control Blankets and Turf Reinforcement Mats:
 - 1. North American Green, LLC
 - 2. Curlex (American Excelsior Company)
 - 3. Propex Global
 - 4. Profile Products LLC
 - 5. West Coast Turf Products
- C. Straw Bales and Wattles:
 - 1. Local agricultural suppliers (certified weed free)
- D. Sediment Basins and Check Dams:
 - 1. Stormwater Management, Inc.
 - 2. ADS (Advanced Drainage Systems)
 - 3. ACF Environmental, Inc.

2.2 MATERIALS

- A. Silt Fence Fabric
 - 1. Filter fabric shall be a woven or non-woven synthetic geotextile meeting ASTM D5141 and ASTM D5035 requirements.
 - 2. Minimum tensile strength: 120 lbs per ASTM D5035.
 - 3. Apparent opening size (AOS): 30 to 50 US standard sieve size.
- B. Posts for Silt Fence

1. Wood posts: Untreated, minimum 2 inch by 2 inch by 48 inches in length.
2. Steel posts: U-shaped with minimum 1.33 lb/ft weight and minimum 48 inches long.
- C. Erosion Control Blankets and Mats
 1. Biodegradable blankets composed of straw, coconut fiber, or wood excelsior with UV degradation within 12 months.
 2. Turf reinforcement mats made of synthetic materials with minimum 5-year durability.
- D. Straw Bales
 1. Certified weed-free, well-tied, minimum dimensions 14 inches by 18 inches by 36 inches.
- E. Sediment Logs and Wattles
 1. Cylindrical tubes filled with straw, coconut fiber, or composted materials encased in UV resistant netting.
- F. Sediment Basins and Check Dams
 1. Constructed of rock, gravel, or manufactured structural materials as per design requirements.
- G. Filter Bags and Fabric Tubes
 1. Durable, UV stabilized geotextile fabric designed for sediment filtration and water flow.

2.3 ACCESSORIES

- A. Stakes, wire, staples, and fasteners compatible with erosion control materials and installation requirements.
- B. Biodegradable erosion control mesh or twine for securing blankets and mats.
- C. Warning and safety signage as required by OSHA and local regulations.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that site conditions are acceptable for erosion and sedimentation control installation including grading, drainage patterns, and soil conditions.
- B. Confirm that necessary permits, approvals, and erosion control plans have been received and reviewed.
- C. Inspect delivered materials for compliance with specifications and storage conditions.

3.2 PREPARATION

- A. Clear and grub areas of vegetation and debris only as necessary to install erosion and sediment controls.
- B. Protect existing vegetation and natural buffers not designated for removal.
- C. Prepare soil surfaces for installation of erosion control blankets and mats by smoothing and ensuring proper moisture content.

3.3 INSTALLATION

- A. 3.3.1 Silt Fence
 1. Install silt fence along contour lines as shown on erosion control plans, prior to commencement of earthwork.

2. Excavate trench at least 6 inches deep to anchor fabric and backfill with compacted soil.
 3. Secure fabric to posts with staples or wire ties at maximum 12 inches on center.
 4. Posts shall be spaced a maximum of 6 feet apart.
 5. Overlap fabric ends a minimum of 12 inches at joints.
- B. 3.3.2 Straw Bale Barriers
1. Install on level contour lines with stakes driven through bales at minimum 24 inches on center.
 2. Place bales end-to-end with minimal gaps and securely tethered.
 3. Backfill and compact soil on uphill side to prevent water flow beneath bales.
- C. d. Replace bales as they deteriorate or become ineffective.
- D. 3.3.3 Erosion Control Blankets and Turf Reinforcement Mats
1. Install on slopes steeper than 3:1 or as indicated on plans.
 2. Anchor blankets with staples or pins at spacing recommended by manufacturer.
 3. Overlap adjacent blankets a minimum of 6 inches following manufacturer's instructions.
 4. Seed and fertilize soil prior to blanket installation unless otherwise directed.
- E. 3.3.4 Sediment Basins and Traps
1. Construct basins according to design drawings and NRCS standards.
 2. Install outlet structures and energy dissipation devices as specified.
 3. Maintain basins free of sediment accumulation exceeding design capacity.
- F. Sediment Logs and Wattles
1. Install along contour lines or at perimeter of disturbed areas.
 2. Secure firmly to ground with stakes placed at intervals not exceeding 4 feet.
- G. Temporary Diversions and Drainage Controls
1. Construct berms, ditches, or swales to divert runoff away from disturbed areas.
 2. Use temporary piping or lined channels as required to prevent erosion.

3.4 MAINTENANCE AND MONITORING

Perform weekly inspections and after storm events to assess condition and effectiveness of erosion and sediment controls.

Repair or replace damaged or ineffective controls immediately.

Remove accumulated sediment from behind controls when sediment reaches 50 percent of barrier height.

Maintain controls until disturbed areas are permanently stabilized with vegetation or other approved measures.

Document maintenance activities and inspection results in logs submitted as per 1.5.2.

3.5 REMOVAL

Remove temporary erosion and sedimentation controls after final site stabilization is achieved and as approved by the Owner or governing agencies.

Dispose of removed materials in accordance with local regulations and environmental requirements.

Restore disturbed areas caused by removal operations to original or specified condition.

3.6 PROTECTION

- A. Protect installed erosion and sedimentation controls from damage by construction activities and equipment.

- B. Restrict access and vehicle traffic over protected areas.
- C. Provide signage and barriers as required for public and worker safety.

END OF SECTION

PART 1 – GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include but are not limited to:
 - 1. Section 31 20 00 – Earth Moving
 - 2. Section 31 23 00 – Excavation and Fill
 - 3. Section 31 23 33 – Excavation and Fill for Structures
 - 4. Section 31 23 19 – Trenching and Backfilling
 - 5. Section 31 25 13 – Soil Erosion and Sedimentation Control
 - 6. Section 31 25 16 – Sedimentation Basins
 - 7. Section 32 92 00 – Turf and Grasses
 - 8. Section 32 93 00 – Plants
 - 9. Section 32 84 00 – Irrigation
 - 10. Section 01 33 00 – Submittal Procedures
 - 11. Section 01 45 00 – Quality Control
 - 12. Section 01 57 00 – Temporary Controls

1.2 REFERENCES, CODES, AND STANDARDS

- A. Applicable codes and standards include, but are not limited to:
- B. American Society for Testing and Materials (ASTM)
 - 1. ASTM D2487 – Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
 - 2. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.
 - 3. ASTM D5035 – Standard Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Method).
 - 4. ASTM D6988 – Standard Guide for Field Testing and Monitoring of Vegetation and Soil Quality on Construction Sites.
- C. U.S. Environmental Protection Agency (EPA)
 - 1. EPA 832-R-92-005 – Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.
- D. U.S. Department of Agriculture Natural Resources Conservation Service (NRCS)
 - 1. NRCS Conservation Practice Standards – Critical Area Planting (Code 342).
 - 2. NRCS Conservation Practice Standards – Mulching (Code 484).
- E. Occupational Safety and Health Administration (OSHA)
 - 1. OSHA 29 CFR Part 1926 – Safety and Health Regulations for Construction.
- F. American Society of Civil Engineers (ASCE)
 - 1. ASCE 7 – Minimum Design Loads for Buildings and Other Structures (for applicable loading on stabilization structures).

G. Local and State Codes and Ordinances for erosion control and sedimentation prevention.

1.3 SUBMITTALS

A. Action Submittals:

1. Product Data: Submit manufacturer's product data, including physical, chemical, and performance characteristics, installation instructions, and maintenance recommendations.
2. Shop Drawings: Submit detailed drawings illustrating erosion and sedimentation control measures including dimensions, materials, locations, and anchorage details.
3. Samples: Submit representative samples of stabilization materials, including fabric, mulch, seed mixtures, and soil amendments.
4. Construction Schedule: Submit schedule indicating timing and sequence of erosion control installation, monitoring, and maintenance.
5. Quality Control Plan: Submit plan detailing inspection, testing, and monitoring procedures for stabilization measures.

B. Informational Submittals:

1. Manufacturer's Certificates: Certify that products comply with specified requirements.
2. Soil Analysis Reports: Submit laboratory soil test results to verify suitability for stabilization measures.
3. Maintenance and Monitoring Reports: Submit documentation of periodic inspections and maintenance activities as required.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:

1. Engage installers who have a minimum of five years' experience in installation of erosion and sedimentation control stabilization measures similar in scope and complexity.

B. Testing Agency:

1. Engage a qualified independent testing laboratory to perform required soil compaction and material quality tests.

C. Regulatory Compliance:

1. Perform work in accordance with all applicable federal, state, and local regulations pertaining to erosion control and sedimentation prevention.

D. Performance Criteria:

1. Stabilization measures shall prevent erosion and sediment loss during and after construction as demonstrated by monitoring and inspection.

E. Environmental Protection:

1. Implement measures to minimize adverse environmental impact including protection of existing vegetation and watercourses.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original unopened containers or bundles with labels intact and legible.
- B. Store materials in a dry, protected location off the ground and protected from sunlight, moisture, and contamination.
- C. Handle materials to prevent damage or deterioration.
- D. Protect temporary erosion control devices from damage during construction operations.
- E. Store seed and mulch materials in accordance with manufacturer recommendations to maintain viability.

1.6 WARRANTIES

- A. Provide a minimum warranty period of two years from date of final acceptance for all stabilization measures installed under this Section.
- B. Warranty shall cover repair or replacement of materials and corrective work required due to failure of erosion and sediment control stabilization measures.
- C. Provide manufacturer's standard product warranties for erosion control fabrics, mats, and other proprietary materials.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Erosion Control Blankets and Mats:
 - 1. Biodegradable erosion control blankets composed of natural fibers such as straw, coconut coir, or wood excelsior, complying with ASTM D6475.
 - 2. Synthetic erosion control mats constructed of UV stabilized polypropylene or polyethylene fibers, resistant to degradation, compliant with ASTM D6459.
- B. Soil Stabilization Fabrics:
 - 1. Woven and nonwoven geotextiles manufactured from polypropylene or polyester, UV stabilized, meeting ASTM D5035 and ASTM D4873 requirements.
- C. Mulch Materials:
 - 1. Straw mulch free of noxious weeds and seeds.
 - 2. Wood cellulose mulch compliant with NRCS standards.
 - 3. Hydromulch mixtures formulated for erosion control and seed germination.
- D. Seed Mixes:
 - 1. Provide seed mixtures consisting of native or adapted species selected for site conditions and erosion control effectiveness. Seed shall be certified and meet purity and germination requirements per local standards.
- E. Soil Amendments:

1. Fertilizers, lime, and soil conditioners as recommended by soil testing laboratory to promote vegetation establishment.
- F. Anchoring Devices:
1. Staples, pins, and stakes fabricated from corrosion-resistant materials sized and spaced per manufacturer's recommendations for securing stabilization materials.

2.2 MANUFACTURERS

- A. Erosion Control Blankets and Mats:
1. North American Green
 2. Profile Products LLC
 3. American Excelsior Company
 4. Western Excelsior
 5. Curlex® by American Excelsior
- B. Soil Stabilization Fabrics:
1. TenCate Geosynthetics
 2. Propex Operating Company, LLC
 3. Huesker, Inc.
- C. Mulch and Hydromulch:
1. Seed Research of Oregon
 2. HydroStraw®
 3. WoodStraw®
- D. Seed Suppliers:
1. Native Seed Network
 2. Ernst Conservation Seeds
 3. Wildflower Farms

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that earthwork and grading operations are complete and conform to lines, grades, and elevations specified.
- B. Confirm that soil surface is free of debris, clods, rocks, and foreign materials that would interfere with stabilization materials.
- C. Inspect soil moisture content and texture to ensure suitability for seed germination and material installation.
- D. Notify Architect/Engineer of unsatisfactory conditions prior to proceeding.

3.2 PREPARATION

- A. Scarify or roughen soil surface as required to provide a suitable bonding surface for stabilization measures.

- B. Apply soil amendments, fertilizer, and lime uniformly per soil test recommendations.
- C. Grade soil surface smooth and uniform without low spots or depressions that could pond water.
- D. Moisten soil as necessary before seeding and installation of erosion control materials.

3.3 INSTALLATION OF STABILIZATION MEASURES

- A. Seeding:
 - 1. Apply seed uniformly at specified rates using mechanical or hand spreaders.
 - 2. Lightly rake or drag seeded area to incorporate seed into soil surface to a depth of 0.5 inch (13 mm).
 - 3. Apply fertilizer and lime if not previously applied during preparation.
- B. Mulching:
 - 1. Apply mulch evenly over seeded areas at thickness recommended by manufacturer and NRCS standards.
 - 2. Secure mulch with tackifiers or netting as specified to prevent displacement.
- C. Erosion Control Blankets and Mats:
 - 1. Place blankets or mats immediately after seeding and mulching or as directed.
 - 2. Lay blankets smooth and tight without wrinkles or folds, overlapping edges per manufacturer's instructions.
 - 3. Anchor blankets with staples or pins at spacing recommended by manufacturer, ensuring secure attachment to soil surface.
 - 4. Overlap adjacent sections minimum 6 inches (150 mm) along edges and 12 inches (300 mm) at ends.
- D. Soil Stabilization Fabrics:
 - 1. Install geotextiles in accordance with manufacturer's instructions and project drawings.
 - 2. Excavate trenches at edges where required for fabric anchorage and bury fabric securely.
 - 3. Maintain fabric tension and alignment during installation to prevent wrinkles or displacement.
- E. Temporary Stabilization:
 - 1. Apply temporary seeding or mulching on disturbed areas not actively worked for longer than 14 days.
- F. Permanent Stabilization:
 - 1. Establish permanent vegetative cover on all disturbed areas as soon as practical after final grading.

3.4 FIELD QUALITY CONTROL

- A. Perform inspections of installed stabilization measures at intervals not exceeding 14 days and after significant rainfall events.
- B. Verify proper installation, anchorage, and condition of erosion control materials.

- C. Inspect seeded areas for germination, uniformity, and coverage.
- D. Identify and repair areas of erosion, displacement, or failure promptly.
- E. Testing: Perform soil compaction tests in areas where soil stabilization fabrics are installed to verify compaction meets ASTM D698 or project requirements.
- F. Documentation: Maintain detailed inspection and maintenance logs including dates, observations, and corrective actions.
- G. Notify Architect/Engineer immediately of any nonconformance or damage requiring corrective action.

3.5 MAINTENANCE

- A. Maintain erosion and sediment control stabilization measures continuously until permanent vegetation is established and site is stabilized.
- B. Water seeded areas as required to promote germination and growth without causing erosion.
- C. Repair or replace damaged erosion control materials promptly.
- D. Remove sediment deposits from silt fences, basins, and other control devices when accumulation reaches 50 percent of design capacity.
- E. Control weeds and invasive species to prevent establishment and damage to stabilization measures.
- F. Continue maintenance activities for a minimum period of two years or until site is permanently stabilized.

3.6 PROTECTION

- A. Protect installed stabilization measures from traffic, equipment, and other construction activities.
- B. Provide temporary fencing or barricades as necessary to prevent disturbance.
- C. Coordinate with other trades to avoid damage during concurrent operations.

3.7 CLEANING

- A. Remove and legally dispose of all construction debris, excess materials, and temporary erosion control devices upon completion of work.
- B. Leave site clean and free of erosion and sedimentation hazards.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

- A. Division 01 – General Requirements
- B. Section 31 20 00 – Earth Moving
- C. Section 32 05 23 – Aggregate Base Courses
- D. Section 32 12 16 – Asphalt Paving
- E. Section 32 13 13 – Concrete Paving
- F. Section 03 30 00 – Cast-in-Place Concrete
- G. Section 31 23 00 – Excavation and Fill for Utilities
- H. Section 32 01 23 – Concrete Paving Joint Sealants
- I. Section 32 05 26 – Concrete Pavement Repair Materials

1.2 REFERENCES, CODES, AND STANDARDS

- A. American Concrete Institute (ACI)
 - 1. ACI 117 – Specifications for Tolerances for Concrete Construction and Materials
 - 2. ACI 318 – Building Code Requirements for Structural Concrete
 - 3. ACI 301 – Specifications for Structural Concrete
- B. American Society for Testing and Materials (ASTM)
 - 1. ASTM C31 – Standard Practice for Making and Curing Concrete Test Specimens in the Field
 - 2. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
 - 3. ASTM C94 – Standard Specification for Ready-Mixed Concrete
 - 4. ASTM C143 – Standard Test Method for Slump of Hydraulic-Cement Concrete
 - 5. ASTM C157 – Standard Test Method for Length Change of Hardened Hydraulic-Cement Concrete
 - 6. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete
 - 7. ASTM C494 – Standard Specification for Chemical Admixtures for Concrete
 - 8. ASTM C928 – Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repairs
 - 9. ASTM D1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction
 - 10. ASTM D6690 – Standard Specification for Joint Sealants, Hot Applied, Elastomeric, for Concrete and Asphalt Pavements
- C. American Concrete Pavement Association (ACPA)
 - 1. ACPA Publication CP-01 – Repairing Concrete Pavements
- D. Occupational Safety and Health Administration (OSHA)
 - 1. OSHA 29 CFR Part 1926 – Safety and Health Regulations for Construction

- E. International Concrete Repair Institute (ICRI)
 - 1. ICRI Guideline No. 310.2R – Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays
- F. Local and State Codes and Regulations
 - 1. Comply with all applicable local and state building codes, environmental regulations, and permitting requirements.

1.3 SUBMITTALS

- A. Action Submittals
 - 1. Product Data: Submit manufacturer's technical data and installation instructions for repair materials, joint sealants, admixtures, curing compounds, and other products.
 - 2. Shop Drawings: Submit detailed repair plan including locations, extent of repair, joint details, and sequencing.
 - 3. Mix Designs: Submit proposed concrete repair mix design including admixtures, water-cement ratio, slump, and air content.
 - 4. Quality Control Plan: Submit procedures for quality control testing, inspection, and acceptance criteria.
 - 5. 1Safety Plan: Submit site-specific safety plan including hazard assessments and compliance with OSHA requirements.
- B. Informational Submittals
 - 1. Manufacturer's Certificates: Provide certificates verifying compliance of materials with specified standards.
 - 2. Material Safety Data Sheets (MSDS): Submit MSDS for all chemical products used in repair.
 - 3. Test Reports: Submit results of pre-construction material tests and trial batch tests.
 - 4. Warranties: Submit sample warranties specified in paragraph 1.7.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Employ experienced installers specializing in concrete paving repair with minimum 5 years documented experience and successful completion of similar projects.
- B. Testing Agency: Engage an independent testing agency to perform field and laboratory tests including concrete compressive strength, slump, air content, and cure verification.
- C. Mock-Up: Construct a mock-up repair area approximately 100 square feet to demonstrate appearance, workmanship, and compatibility of materials. Approval required before proceeding.
- D. Tolerances: Comply with ACI 117 tolerances for concrete repair thickness, surface finish, and joint alignment.

- E. Environmental Conditions: Perform repairs within manufacturer-recommended ambient temperature and humidity ranges. Protect repair area from precipitation, freezing, and excessive heat during installation and curing.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original unopened containers or packaging, clearly labeled with manufacturer's name, product identification, batch number, and expiration date.
- B. Store cementitious materials in a dry, well-ventilated area protected from moisture and contamination.
- C. Store admixtures and chemical products in accordance with manufacturer's instructions, maintaining recommended temperature ranges.
- D. Handle all materials to prevent damage, contamination, and deterioration. Use sealed containers and protect from exposure to sun and weather.
- E. Dispose of packaging and waste materials in accordance with applicable environmental regulations.

1.7 WARRANTIES

- A. Provide manufacturer's standard warranty for repair materials covering defects in materials and workmanship for a minimum period of one year from date of acceptance.
- B. Provide Contractor's warranty guaranteeing repair workmanship against defects for a minimum period of two years from date of acceptance.
- C. Warranty shall include repair or replacement of defective work at no cost to the Owner.
- D. Submit warranty documents prior to final acceptance.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cementitious Repair Materials
 - 1. Use rapid-setting or standard-setting cementitious repair mortars complying with ASTM C928.
 - 2. Provide repair materials with compressive strength meeting or exceeding 4000 psi at 28 days.
 - 3. Use materials compatible with existing concrete substrate and environment.
- B. Concrete
 - 1. Provide ready-mixed concrete complying with ASTM C94, with minimum 28-day compressive strength as specified in project documents.
 - 2. Use air-entrained concrete for freeze-thaw durability per ASTM C260.
- C. Joint Sealants and Fillers
 - 1. Use preformed expansion joint filler complying with ASTM D1751.

2. Use hot-applied or cold-applied elastomeric joint sealants complying with ASTM D6690.
- D. Admixtures
 1. Use admixtures complying with ASTM C494 as required for water reduction, set control, or air entrainment.
- E. Curing Compounds
 1. Use curing compounds compatible with repair materials and meeting ASTM C309.
- F. Aggregates
 1. Use aggregates conforming to ASTM C33 or project-specific grading requirements for repair mortar and concrete.

2.2 MANUFACTURERS

- A. Cementitious Repair Materials
 1. Sika Corporation – SikaQuick Repair Mortars
 2. BASF Corporation – MasterEmaco S 488
 3. Euclid Chemical Company – Euco Repair
 4. Mapei Corporation – Planitop X
- B. Joint Sealants and Fillers
 1. Pecora Corporation – Pecora 895
 2. D.S. Brown Company – D.S. Brown Joint Sealants
 3. Sonneborn – Sonolastic NP1
- C. Concrete Admixtures
 1. GCP Applied Technologies – ADVA admixtures
 2. Sika Corporation – Sika admixtures
- D. Curing Compounds
 1. Dayton Superior – Aquafilm
 2. Euclid Chemical Company – Euclid Cure & Seal

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify extent and locations of repair work with Contract Documents and site conditions.
- B. Inspect existing concrete paving for cracks, spalls, joint distress, and surface defects.
- C. Verify substrate is sound, clean, free of deleterious materials, loose particles, oils, and contaminants.
- D. Confirm ambient and substrate temperatures are within limits prescribed by repair material manufacturers.

3.2 PREPARATION

- A. Remove deteriorated concrete, unsound material, and loose debris by mechanical means such as chipping, grinding, or hydro-demolition.
- B. Cut back repair edges to square or slightly beveled profiles to provide sound substrate and bonding surface.
- C. Clean repair areas by abrasive blasting or high-pressure water blasting to achieve ICRI CSP 3-5 profile.
- D. Remove all dust, dirt, and debris by vacuum or compressed air immediately prior to placement of repair materials.
- E. Saturate concrete substrate with clean potable water to saturated surface dry (SSD) condition unless otherwise directed by manufacturer.

3.3 INSTALLATION OF REPAIR MATERIALS

- A. Mix repair materials in accordance with manufacturer's instructions using approved mixing equipment.
- B. Place repair material promptly after mixing to prevent premature setting.
- C. Apply bonding agents or primers as recommended by repair material manufacturer.
- D. Place repair material in layers not exceeding maximum thickness per manufacturer's recommendations.
- E. Consolidate repair material thoroughly to eliminate voids and achieve full bond with substrate.
- F. Finish surface to match existing adjacent pavement texture and elevation.
- G. Protect repair area from traffic, precipitation, and temperature extremes during curing period.
- H. Remove forms and perform joint repairs as specified after sufficient curing time.

3.4 JOINT REPAIR AND SEALING

- A. Clean and prepare existing joints to receive new sealant or filler.
- B. Replace or install new preformed joint fillers as required to restore joint function.
- C. Apply joint sealants in strict accordance with manufacturer's instructions, ensuring proper joint width-to-depth ratio and tooling.
- D. Protect joint sealants during cure period from contamination and damage.

3.5 FIELD QUALITY CONTROL

- A. Conduct slump, air content, and temperature tests on concrete repair mixes at frequency specified by testing agency.
- B. Cast and cure test cylinders for compressive strength testing at 7 and 28 days.
- C. Monitor environmental conditions during placement and curing; record data for compliance verification.
- D. Inspect finished repairs for surface defects, cracking, delamination, and adherence to tolerances.

- E. Remove and replace repairs failing to meet quality standards at no additional cost.

3.6 PROTECTION

- A. Protect repaired pavement from vehicular traffic and heavy loads until repair materials achieve specified strength and curing requirements.
- B. Implement erosion and sediment control measures during and after repair work.
- C. Maintain repair areas and adjacent surfaces free of debris and spilled materials.

3.7 CLEANING

- A. Remove excess materials, debris, and equipment from site daily.
- B. Clean all tools and equipment immediately after use.
- C. Restore site conditions affected by repair work to original or better condition.

END OF SECTION

PART 1 – GENERAL

1.1 RELATED SECTIONS

- A. Section 31 20 00 – Earth Moving
- B. Section 32 12 16 – Asphalt Paving
- C. Section 32 13 13 – Concrete Paving
- D. Section 32 14 13 – Asphaltic Concrete Paving
- E. Section 32 91 23 – Turf and Grasses
- F. Section 01 33 00 – Submittal Procedures
- G. Section 01 45 00 – Quality Control
- H. Section 01 78 00 – Closeout Submittals

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO)
 - 1. AASHTO M 140 – Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base, and Surface Courses
 - 2. AASHTO T 99 – Moisture-Density Relations of Soils Using a 5.5-lb Rammer and 12-in. Drop
 - 3. AASHTO T 180 – Moisture-Density Relations of Soils Using a 10-lb Rammer and 18-in. Drop
 - 4. AASHTO T 27 – Sieve Analysis of Fine and Coarse Aggregates
 - 5. AASHTO T 88 – Particle Size Analysis of Soils
- B. ASTM International (ASTM)
 - 1. ASTM D698 – Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³)
 - 2. ASTM D1557 – Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³)
 - 3. ASTM D4318 – Liquid Limit, Plastic Limit, and Plasticity Index of Soils
 - 4. ASTM D2487 – Classification of Soils for Engineering Purposes (Unified Soil Classification System)
 - 5. ASTM D2940 – Graded Aggregate Material for Bases or Subbases for Highways or Airports
- C. Federal Highway Administration (FHWA)
 - 1. FHWA Technical Advisory T 5040.27 – Quality Assurance for Construction Materials Testing
- D. Occupational Safety and Health Administration (OSHA)
 - 1. OSHA 29 CFR Part 1926 – Safety and Health Regulations for Construction

1.3 SUBMITTALS

A. Action Submittals

1. Product Data: Submit manufacturers' technical data, including material compositions, physical properties, and installation instructions for aggregate base materials.
2. Mix Design: Submit proposed aggregate gradation and mix design certified by a qualified testing laboratory.
3. Quality Control Plan: Submit a detailed plan outlining testing procedures, frequency, and acceptance criteria for compaction and material quality.
4. Samples: Submit representative samples of aggregate material in sizes specified for approval.
5. Construction Schedule: Submit a schedule indicating anticipated start and completion dates of base course placement and compaction activities.

B. Informational Submittals

1. Test Reports: Submit results of laboratory and field tests including gradation, compaction, moisture content, and density testing.
2. Certifications: Submit certificates of compliance for materials used, including verification of aggregate source and compliance with specified standards.
3. Inspection Reports: Submit inspection and monitoring reports documenting compliance with specified quality assurance requirements.

1.4 QUALITY ASSURANCE

A. Qualifications

1. Installer Qualifications: Engage experienced installers with a minimum of five years documented experience in placing and compacting asphaltic base courses similar in material and scope to this project.
2. Testing Laboratory: Use an independent testing agency qualified in performing soil and aggregate testing according to ASTM and AASHTO standards.

B. Pre-Installation Conference

1. Conduct a pre-installation meeting to review project requirements, quality control procedures, and coordination with other trades.

C. Mock-Up

1. Provide a mock-up section of base course not less than 100 square feet to demonstrate compliance with density, thickness, and surface tolerances.

D. Field Quality Control

1. Conduct in-place density testing at a frequency not less than one test per 1,000 square yards or as required by the Engineer.
2. Perform moisture content testing to ensure material is within optimum moisture range for compaction.
3. Verify thickness and surface tolerances using approved measuring devices.

E. Nonconformance

1. Remove and replace or rework base course material failing to meet specified requirements.

F. Regulatory Compliance

1. Comply with all applicable federal, state, and local environmental, health, and safety regulations related to materials, handling, and placement.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery

1. Deliver aggregate base materials in clean, dry condition, free of foreign materials or contaminants.
2. Deliver materials in quantities and at times to avoid delays in construction.

B. Storage

1. Stockpile aggregate materials on well-drained surfaces to prevent contamination or segregation.
2. Protect materials from exposure to excessive moisture or freezing conditions.

C. Handling

1. Handle materials to prevent segregation of particle sizes and contamination.
2. Use equipment and methods that do not degrade the quality or gradation of aggregate base materials.

1.7 WARRANTIES

A. Material Warranty

1. Provide a minimum one-year warranty for materials used in the base course from the date of substantial completion, ensuring they meet specified gradation and quality requirements.

B. Workmanship Warranty

1. Provide a minimum one-year warranty for workmanship covering defects in placement, compaction, and adherence to thickness and density specifications.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Aggregate Base Course Material

1. Aggregate base course shall consist of crushed stone, crushed slag, crushed gravel, or natural gravel conforming to ASTM D2940 and AASHTO M 140.
2. Material shall be free from organic matter, clay lumps, or other deleterious substances.
3. Gradation requirements:
 - a) 100% passing 1-inch sieve
 - b) 50-85% passing 3/8-inch sieve
 - c) 25-60% passing No. 4 sieve
 - d) 10-35% passing No. 200 sieve

4. Plasticity Index (PI) shall not exceed 6 as determined by ASTM D4318.
- B. Water
 1. Water used for moisture conditioning and compaction shall be potable and free from harmful salts or impurities.

2.2 MANUFACTURERS

- A. Aggregate Producers
 1. Vulcan Materials Company
 2. Martin Marietta Materials
 3. Oldcastle Materials
 4. Lehigh Hanson, Inc.
 5. Local approved quarry sources as verified by Engineer
- B. Testing Agencies
 1. SGS North America
 2. Intertek Group plc
 3. Bureau Veritas
 4. Local state-certified laboratories

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade is prepared in accordance with Section 31 20 00 – Earth Moving, with final grading complete and acceptable to Engineer.
- B. Confirm that drainage provisions are in place and functioning to prevent water accumulation beneath base course.
- C. Notify Engineer of unsatisfactory conditions prior to placement.

3.2 PREPARATION

- A. Scarify and compact subgrade to minimum 95% of maximum dry density as determined by ASTM D698 or AASHTO T 99 unless otherwise specified.
- B. Remove soft, unstable, or unsuitable materials and replace with approved fill.
- C. Verify moisture content of subgrade is within $\pm 2\%$ of optimum for compaction.

3.3 PLACEMENT

- A. Place aggregate base course in uniform layers not exceeding 8 inches loose thickness.
- B. Spread material evenly using mechanical spreaders or approved equipment to avoid segregation.
- C. Maintain moisture content within $\pm 2\%$ of optimum for maximum compaction during placement.

- D. Compact each layer to at least 98% of maximum dry density as determined by ASTM D698 or AASHTO T 99.
- E. Shape surface to required grade and cross-section with tolerance of ± 0.1 foot in elevation and ± 0.1 foot in lateral alignment.
- F. Remove and replace any base course material that does not meet thickness, density, or moisture requirements.

3.4 FIELD QUALITY CONTROL

- A. Testing
 - 1. Perform in-place density tests at a minimum frequency of one test per 1,000 square yards per layer or as directed by Engineer.
 - 2. Conduct moisture content tests at a minimum of one test per 500 square yards during placement.
 - 3. Submit test results to Engineer within 24 hours of testing.
- B. Acceptance Criteria
 - 1. Minimum in-place density shall be 98% of laboratory maximum dry density.
 - 2. Thickness tolerance shall be within ± 0.5 inches of design thickness per lift.
 - 3. Surface tolerance for finished base course shall not deviate more than 0.1 foot from specified grade.
- C. Noncompliance
 - 1. Base course failing to meet specified density, thickness, or grading tolerances shall be removed and replaced or re-compacted to meet requirements.
 - 2. Additional testing shall be performed after corrective work.

3.5 PROTECTION

- A. Protect completed base course from traffic, erosion, and contamination until subsequent paving or surfacing is placed.
- B. Do not allow construction equipment to operate on base course unless approved by Engineer.
- C. Repair damage resulting from construction operations at no additional cost.

3.6 CLEANING

- A. Remove excess and waste materials from site in accordance with Section 01 74 19 – Construction Waste Management and Disposal.
- B. Leave base course surface clean, uniform, and ready for subsequent construction.

END OF SECTION 32 11 26

BUILDING FOR ROGERS FACILITIES DEPARTMENT
ROGERS, AR

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DEMX ARCHITECTURE
FAYETTEVILLE, AR

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes

1. Asphalt paving for vehicular and pedestrian use.
2. Asphalt binder courses and surface courses.
3. Preparation of base and subbase for asphalt paving.
4. Joint treatment and edge details.

B. Related Sections

1. Division 31 – Earthwork
2. Division 32 11 23 – Aggregate Base Courses
3. Division 32 13 13 – Concrete Paving
4. Division 32 17 23 – Pavement Markings
5. Division 32 18 23 – Asphalt Millings and Recycled Asphalt
6. Division 32 91 00 – Planting and Ground Cover
7. Division 01 – General Requirements and Coordination

1.2 REFERENCES, CODES, AND STANDARDS

A. American Association of State Highway and Transportation Officials (AASHTO)

1. AASHTO M 292 – Standard Specification for Performance-Graded Asphalt Binder
2. AASHTO T 85 – Specific Gravity of Bituminous Materials
3. AASHTO T 308 – Determining the Asphalt Binder Content of Hot Mix Asphalt (HMA) by the Ignition Method

B. ASTM International

1. ASTM D946 – Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction
2. ASTM D1559 – Standard Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
3. ASTM D2041 – Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
4. ASTM D3381 – Standard Test Method for Viscosity of Asphalt Materials
5. ASTM D4867 – Standard Test Method for Effect of Heat and Air on a Moving Film of Asphalt (Rolling Thin-Film Oven Test)
6. ASTM D6926 – Standard Test Method for Asphalt Binder Content of Hot Mix Asphalt by Ignition Method

C. National Asphalt Pavement Association (NAPA)

1. NAPA Quality Control/Quality Assurance Guidelines for Hot Mix Asphalt

D. Asphalt Institute

1. MS-2 – Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types
2. MS-19 – Asphalt Pavement Construction

- E. Federal Highway Administration (FHWA)
 - 1. FHWA-HIF-12-003 – Hot Mix Asphalt Pavement Construction Best Practices
- F. Occupational Safety and Health Administration (OSHA) Standards
- G. Local and State Department of Transportation (DOT) Standards, as applicable

1.3 DEFINITIONS

- A. Asphalt Binder: The bituminous material used to bind aggregate particles in asphalt concrete.
- B. Hot Mix Asphalt (HMA): A mixture of aggregate and asphalt binder heated and mixed at elevated temperatures for paving applications.
- C. Tack Coat: A light application of asphalt emulsion applied between pavement layers to promote bond.
- D. Prime Coat: An application of low viscosity asphalt to an unbound base layer to improve bonding with the asphalt surface.
- E. Lift: A single layer of asphalt paving placed during one operation.

1.4 SUBMITTALS

- A. Action Submittals
 - 1. Product Data: Manufacturer's technical data sheets for asphalt binder, emulsions, additives, and paving materials.
 - 2. Mix Design: Submit proposed hot mix asphalt mix design including gradation, binder content, air voids, and performance properties certified by a qualified laboratory.
 - 3. Quality Control Plan: Detailed plan outlining procedures for mix production, testing frequency, paving operations, and acceptance criteria.
 - 4. Equipment List: Identification and description of paving, compaction, and testing equipment.
 - 5. Construction Schedule: Proposed schedule for paving operations including weather and temperature considerations.
 - 6. Certifications: Asphalt binder certification confirming compliance with specified performance grades and material properties.
- B. Informational Submittals
 - 1. Test Reports: Laboratory test results verifying compliance of materials and mix design with specified requirements.
 - 2. Field Quality Control Reports: Documentation of on-site testing during paving operations.
 - 3. Manufacturer's Installation Instructions.

1.5 QUALITY ASSURANCE

- A. Qualifications:

1. Paving Contractor shall have a minimum of five years' experience in asphalt paving of similar scope and magnitude.
- B. Testing laboratory shall be accredited and experienced in hot mix asphalt testing.
- C. Testing and Inspection:
 1. Materials shall be tested per ASTM and AASHTO standards referenced.
 2. Field density and compaction testing to be performed using nuclear density gauge or core sampling as per project requirements.
 3. Continuous monitoring of temperature during production and placement to meet specification limits.
- D. Mock-Up:
- E. Provide a test strip or mock-up of paving to demonstrate finish, compaction, and joint treatment acceptable to the Architect/Engineer prior to full-scale paving.
- F. Compliance:
 1. All work shall comply with applicable local, state, and federal regulations governing asphalt paving.
- G. Environmental Requirements:
 1. Asphalt paving shall not be performed when ambient temperature is below manufacturer's recommended limits or when weather conditions could impair quality.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery:
 1. Deliver asphalt binder and emulsions in manufacturer's original, unopened containers with labels intact.
 2. Hot mix asphalt shall be delivered promptly to maintain temperature and workability.
- B. Storage:
 1. Store asphalt binder and emulsions in temperature-controlled facilities to prevent degradation.
 2. Aggregate stockpiles shall be maintained free from contamination and segregation.
- C. Handling:
 1. Handle all materials to prevent contamination and damage.
 2. Use approved equipment for loading, transport, and placement of hot mix asphalt.

1.7 WARRANTY

- A. Provide a warranty for the asphalt paving materials and workmanship for a period of not less than one year from date of substantial completion.
- B. Warranty shall cover defects such as cracking, rutting, delamination, and premature failure not due to normal wear or structural deficiencies in underlying base.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Asphalt Binder:
 - 1. Performance Grade (PG) binder shall comply with AASHTO M 292 and ASTM D946. Typical grade: PG 64-22 or as specified.
 - 2. Binder shall be free of contaminants and meet viscosity and penetration requirements.
- B. Aggregates:
 - 1. Aggregates shall comply with ASTM C33 or local DOT gradation requirements.
 - 2. Aggregates shall be clean, hard, durable, and free of deleterious materials.
- C. Hot Mix Asphalt (HMA):
 - 1. Mix design shall conform to Asphalt Institute MS-2 mix design methods.
 - 2. Mixture gradation and binder content shall comply with project-specific requirements.
 - 3. Air void content shall be between 3% and 5% after compaction.
- D. Tack Coat:
 - 1. Use SS-1h or CSS-1h asphalt emulsions conforming to ASTM D2397.
- E. Prime Coat:
 - 1. Use low viscosity asphalt materials conforming to ASTM D2027 or local DOT standards.
- F. Additives and Modifiers:
 - 1. Additives such as anti-stripping agents may be used as approved.
- G. Joint Sealants:
 - 1. Use hot-pour rubberized asphalt sealants or as specified for longitudinal and transverse joints.

2.2 MANUFACTURERS

- A. Asphalt Binder Suppliers:
 - 1. Valero Energy Corporation
 - 2. NuStar Energy L.P.
 - 3. Marathon Petroleum Corporation
- B. Hot Mix Asphalt Producers:
 - 1. Granite Construction Inc.
 - 2. Vulcan Materials Company
 - 3. Martin Marietta Materials
- C. Asphalt Emulsion Suppliers:
 - 1. Ergon Asphalt & Emulsions, Inc.
 - 2. McAsphalt Industries Limited
- D. Additive Suppliers:
 - 1. BASF Corporation

- 2. Evonik Industries AG
- E. Joint Sealant Manufacturers:
 - 1. Crafc0, Inc.
 - 2. Sonneborn, a BASF company

2.3 EQUIPMENT

- A. Paving Equipment:
 - 1. Self-propelled asphalt pavers capable of placing uniform lifts at specified widths and thicknesses.
- B. Compaction Equipment:
 - 1. Steel-wheeled rollers and pneumatic-tired rollers suitable for effective compaction of HMA.
- C. Temperature Measuring Devices:
 - 1. Infrared or contact thermometers for verifying mix and pavement temperatures.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that base and subbase courses have been installed and compacted to required tolerances and densities.
- B. Confirm that drainage and grading are complete and conform to project drawings.
- C. Notify Architect/Engineer of unsatisfactory conditions before proceeding.

3.2 PREPARATION

- A. Clean base surfaces of dust, dirt, loose materials, and debris.
- B. Apply prime coat to unbound base if specified, and allow curing as recommended.
- C. Apply tack coat to existing asphalt surfaces or between lifts as specified.

3.3 INSTALLATION

- A. Hot Mix Asphalt Production:
 - 1. Produce HMA at temperatures recommended by manufacturer, typically between 275°F and 325°F.
 - 2. Maintain uniform mixing and delivery to paving site.
- B. Paving:
 - 1. Place asphalt mix in layers not exceeding specified lift thickness (typically 2 to 3 inches).
 - 2. Spread and strike off mix uniformly to required grade and slope.
- C. Compaction:
 - 1. Begin compaction immediately after paving while mix is still hot.

2. Achieve density not less than 92% of maximum theoretical density determined by ASTM D2041.
 3. Use multiple roller passes with steel and pneumatic rollers to achieve uniform compaction.
- D. Joints:
1. Construct longitudinal and transverse joints to provide a smooth, continuous surface.
 2. Treat joints with tack coat prior to adjoining lift placement.
 3. Seal joints with specified joint sealant after compaction.
- E. Surface Finish:
1. Surface shall be smooth, free of segregation, and compacted uniformly.
 2. Correct irregularities exceeding 1/4 inch in 10 feet.

3.4 FIELD QUALITY CONTROL

- A. Testing Frequency:
1. Perform gradation and binder content tests on mix samples at a minimum frequency of one test per 500 tons or as specified.
 2. Conduct density tests on paved lifts at intervals not less than one test per 1,000 square yards.
- B. Temperature Monitoring:
1. Record mix and pavement temperature at start, during, and at completion of paving.
- C. Acceptance Criteria:
1. Mix properties and compaction must comply with specified tolerances.
 2. Reject and remove paving not conforming to requirements.

3.5 PROTECTION AND CLEANUP

- A. Protect newly placed asphalt from traffic and adverse weather for minimum curing period specified by manufacturer.
- B. Remove excess materials, debris, and equipment from site upon completion.
- C. Repair any damage to adjacent surfaces or structures caused by paving operations.

3.6 MAINTENANCE

- A. Maintain asphalt pavement in good condition for duration of warranty period.
- B. Perform crack sealing, patching, and surface treatments as required to preserve pavement integrity.

END OF SECTION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include, but are not limited to:
 - 1. Section 01 33 00 - Submittal Procedures
 - 2. Section 01 45 00 - Quality Control
 - 3. Section 01 60 00 - Product Requirements
 - 4. Section 03 30 00 - Cast-in-Place Concrete
 - 5. Section 31 20 00 - Earth Moving
 - 6. Section 32 11 23 - Aggregate Base Courses
 - 7. Section 32 92 00 - Turf and Grasses
 - 8. Section 32 17 23 - Concrete Curbs and Sidewalks

1.2 REFERENCES, CODES AND STANDARDS

- A. American Concrete Institute (ACI)
 - 1. ACI 301 - Specifications for Structural Concrete
 - 2. ACI 302.1R-04 - Guide for Concrete Floor and Slab Construction
 - 3. ACI 305R - Hot Weather Concreting
 - 4. ACI 306R - Cold Weather Concreting
- B. American Society for Testing and Materials (ASTM)
 - 1. ASTM C33 - Specification for Concrete Aggregates
 - 2. ASTM C94/C94M - Specification for Ready-Mixed Concrete
 - 3. ASTM C143/C143M - Test Method for Slump of Hydraulic-Cement Concrete
 - 4. ASTM C150/C150M - Specification for Portland Cement
 - 5. ASTM C157/C157M - Test Method for Length Change of Hardened Hydraulic-Cement Concrete
 - 6. ASTM C172 - Practice for Sampling Freshly Mixed Concrete
 - 7. ASTM C260 - Specification for Air-Entraining Admixtures for Concrete
 - 8. ASTM C494/C494M - Specification for Chemical Admixtures for Concrete
 - 9. ASTM C595/C595M - Specification for Blended Hydraulic Cements
 - 10. ASTM C618 - Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
 - 11. ASTM C682 - Test Method for Length Change of Concrete Due to Alkali-Silica Reaction
 - 12. ASTM C642 - Test Method for Density, Absorption, and Voids in Hardened Concrete
- C. American Association of State Highway and Transportation Officials (AASHTO)
 - 1. AASHTO M 85 - Standard Specification for Portland Cement

- 2. AASHTO M 145 - Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes
- D. Portland Cement Association (PCA)
- E. U.S. Green Building Council (USGBC)
- F. Occupational Safety and Health Administration (OSHA)
 - 1. OSHA 29 CFR 1926 - Safety and Health Regulations for Construction

1.3 QUALITY ASSURANCE

- A. Perform concrete paving work in accordance with ACI 301 and ACI 302.1R and other referenced standards.
- B. Concrete mix design shall be developed and approved by a qualified testing agency experienced in concrete paving.
- C. Testing laboratory shall be independent and certified in accordance with ASTM C1077 and ASTM E329.
- D. Installer qualifications: Experienced in similar concrete paving projects with documented successful installations.
- E. Mock-up: Provide a mock-up panel of concrete paving, minimum 100 square feet, to demonstrate surface finish, jointing, and coloration.
- F. Conduct pre-paving conference to review procedures, quality control, and safety measures.

1.4 ACTION SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for cementitious materials, admixtures, curing compounds, joint fillers, and sealers.
- B. Mix Designs: Submit proposed concrete mix designs including materials, proportions, and admixtures with supporting test data.
- C. Samples: Submit physical samples of curing compounds, joint sealants, and surface finish treatments.
- D. Shop Drawings: Submit layout drawings showing joint spacing, patterns, thickness, reinforcement, and edge treatments.
- E. Certificates: Submit certification of compliance for cement, aggregates, admixtures, and other materials as specified.

1.5 INFORMATIONAL SUBMITTALS

- A. Test Reports: Submit test reports for aggregates, cementitious materials, and trial batch concrete.
- B. Installation Instructions: Manufacturer's recommended installation instructions for products used in concrete paving.
- C. Maintenance Data: Submit maintenance instructions for concrete paving, including cleaning and repair.

- D. Warranties: Submit manufacturer and installer warranties as specified.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver cement, aggregates, admixtures, and other materials in original unopened containers with labels intact.
- B. Store cement and cementitious materials in a dry, moisture-proof area. Protect from contamination and moisture damage.
- C. Store aggregates to prevent segregation, contamination, and moisture accumulation.
- D. Store admixtures in accordance with manufacturer's recommendations and protect from freezing or overheating.
- E. Handle materials to prevent damage or contamination. Use equipment and methods to prevent segregation or loss of materials.

1.7 WARRANTY

- A. Provide a minimum 1-year warranty on concrete paving against defects in materials and workmanship from date of final acceptance.
- B. Provide manufacturer's warranties on chemical admixtures, curing compounds, sealants, and other proprietary materials as applicable.
- C. Warranty shall include repair or replacement of defective paving including removal and replacement of unsatisfactory concrete.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Portland Cement: ASTM C150, Type I or II, or ASTM C595 blended hydraulic cement as approved.
- B. Aggregates: ASTM C33, clean, hard, durable, and graded aggregates. Coarse and fine aggregates free of deleterious substances.
- C. Water: Clean, potable, free from impurities that may affect setting, strength or durability.
- D. Admixtures: ASTM C494 compliant chemical admixtures, including water reducers, air-entraining agents, retarders, and accelerators as required.
- E. Reinforcement: If required, use welded wire fabric or steel reinforcing bars conforming to ASTM A615 or ASTM A1064.
- F. Joint Materials:
 - 1. Joint Fillers: ASTM D1751 bituminous fiber expansion joint fillers or preformed elastomeric joint fillers.
 - 2. Joint Sealants: Polyurethane or silicone sealants compatible with concrete, ASTM C920 compliant.
- G. Curing Compounds: ASTM C309, clear or translucent, designed for curing concrete pavements.

- H. Surface Finishes: Broom finish or as indicated on drawings.
- I. Subbase and Base Materials: As specified in Section 32 11 23 - Aggregate Base Courses.

2.2 MANUFACTURERS

- A. 2.2.1 Cement and Admixtures:
 - 1. LafargeHolcim
 - 2. CEMEX
 - 3. BASF Construction Chemicals
 - 4. Sika Corporation
- B. Aggregates:
 - 1. Local approved quarries or suppliers meeting ASTM C33 requirements.
- C. Joint Fillers and Sealants:
 - 1. W.R. Meadows
 - 2. Pecora Corporation
 - 3. Sonneborn (Grace Construction Products)
- D. Curing Compounds:
 - 1. Euco (Euclid Chemical Company)
 - 2. W.R. Meadows
- E. Reinforcement:
 - 1. Nucor Steel
 - 2. CMC Rebar

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade and base course have been installed and compacted to required density and tolerances.
- B. Ensure that subgrade is free of soft spots, debris, frost, or frozen material.
- C. Verify layout, elevations, and grades are established and conform to drawings and specifications.
- D. Notify Architect/Engineer of any conditions detrimental to quality or performance of concrete paving. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

- A. Grade and compact subgrade and base course in accordance with Section 31 20 00 and Section 32 11 23.
- B. Moisten subgrade and base to uniform dampness without standing water immediately before placing concrete.
- C. Set and secure forms to lines and grades with adequate strength to withstand concrete placement and finishing operations.

- D. Provide joint layout and insert joint materials as specified.

3.3 CONCRETE MIXING AND DELIVERY

- A. Mix concrete in accordance with ASTM C94 and approved mix designs.
- B. Maintain slump between 3 and 5 inches unless otherwise directed.
- C. Use air-entrained concrete with air content between 5% and 8% for freeze-thaw durability.
- D. Deliver concrete to site promptly and discharge into forms or placing equipment without segregation.
- E. During hot or cold weather, comply with ACI 305R and ACI 306R respectively.

3.4 PLACING CONCRETE

- A. Place concrete continuously between expansion joints to prevent cold joints.
- B. Deposit concrete as close as possible to final position to minimize segregation.
- C. Consolidate concrete with internal vibrators without over-vibration.
- D. Screed to grade and strike off to produce a uniform surface.
- E. Perform initial surface finishing as soon as bleed water disappears, using bull float or darby.

3.5 JOINTING

- A. Install contraction joints at maximum spacing of 15 feet or as indicated on drawings.
- B. Form joints with saw-cut or formed joints as approved.
- C. Install expansion joints at intervals indicated on drawings with compressible filler.
- D. Seal joints with approved sealant after curing period, ensuring joints are clean and dry.

3.6 FINISHING

- A. Apply broom finish perpendicular to traffic direction for slip resistance.
- B. Edges: Round edges with edging tool to 1/4 inch radius unless otherwise indicated.
- C. Remove surface defects and repair minor imperfections immediately.

3.7 CURING

- A. Begin curing immediately after finishing operations.
- B. Use curing compound applied uniformly at manufacturer's recommended rate.
- C. Alternatively, use wet curing methods such as wet burlap or polyethylene sheeting for a minimum of 7 days.
- D. Protect concrete from rapid moisture loss, freezing, rain, and contamination during curing period.

3.8 PROTECTION AND CLEANING

- A. Protect newly placed concrete from traffic and construction loads until it attains sufficient strength.
- B. Remove forms and joint filler carefully without damaging concrete edges.
- C. Clean concrete surfaces of stains, dirt, and curing residues using methods approved by Architect/Engineer.
- D. Repair or replace defective or damaged concrete paving as directed.

3.9 FIELD QUALITY CONTROL

- A. Testing Agency Responsibilities:
 - 1. Perform slump tests, air content, temperature, and casting of test specimens in accordance with ASTM C172, ASTM C143, and ASTM C231.
 - 2. Test concrete compressive strength at 7 and 28 days per ASTM C39.
 - 3. Perform additional tests as required to verify compliance with mix design and performance criteria.
- B. Monitor joint spacing, depth, and sealant installation for compliance.
- C. Document all quality control tests and submit reports promptly.

3.10 REPAIRS AND PATCHING

- A. Repair minor surface defects with approved patching mortar compatible with existing concrete.
- B. For major defects or failures, remove defective concrete and replace with new concrete as specified.
- C. Ensure repairs match adjoining concrete in finish, texture, and color.

3.11 MAINTENANCE

- A. Clean concrete paving periodically with water and mild detergents.
- B. Inspect and maintain joint sealants to prevent infiltration of water and debris.
- C. Repair surface damage promptly to maintain durability and appearance.

END OF SECTION 32 13 13

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include but are not limited to:
 - 1. Section 31 20 00 – Earth Moving
 - 2. Section 31 23 00 – Excavation and Fill
 - 3. Section 32 13 13 – Soil Preparation
 - 4. Section 32 93 00 – Planting
 - 5. Section 32 90 00 – Planting Irrigation
 - 6. Section 33 11 00 – Water Utility Distribution Piping

1.2 SUMMARY

- A. This Section includes furnishing and installing turf and grasses including:
 - 1. Preparation of seedbeds and soil amendments.
 - 2. Installation of turf by seeding, sodding, or hydroseeding.
 - 3. Fertilizing, watering, and initial maintenance.
- B. Related requirements include:
 - 1. Soil testing and analysis (Section 32 13 13).
 - 2. Irrigation for turf establishment (Section 32 90 00).

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM D2487 – Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)
 - 2. ASTM D5268 – Standard Practice for Topsoil Fines Assessment
- B. American Association of Nurserymen (AAN)
 - 1. AAN Z60.1 – Nursery Stock Standards
- C. American Society of Agronomy (ASA)
- D. Federal Seed Act (FSA)
- E. International Code Council (ICC)
 - 1. International Building Code (IBC)
- F. Turfgrass Producers International (TPI)
- G. U.S. Department of Agriculture (USDA)
- H. U.S. Green Building Council (USGBC)

1.4 DEFINITIONS

- A. Turf: A surface layer of earth containing a dense growth of grass and its matted roots.
- B. Seedbed: Prepared soil surface to receive grass seed or sod.
- C. Hydroseeding: Application of seed, mulch, fertilizer, and water in a slurry by spraying.
- D. Sodding: Installation of pre-grown turf cut into sections.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Engage an experienced installer who has successfully completed turf and grass installation similar in scope and quality to this project.
 - 2. Installer shall be a member of Turfgrass Producers International or similar professional turf association.
- B. Source Quality:
 - 1. Obtain seed and sod from sources with a minimum of 5 years' experience growing and supplying turf materials in the project region.
 - 2. Provide seed and sod that comply with applicable state and federal regulations.
- C. Regulatory Requirements:
 - 1. Comply with Federal Seed Act and applicable state seed laws regarding seed labeling, purity, and germination.
 - 2. Comply with local codes including International Building Code requirements for erosion and sediment control related to turf installation.
- D. Testing and Verification:
 - 1. Soil Testing: Perform soil analysis prior to seeding or sodding to determine pH, nutrient levels, and organic matter content.
 - 2. Seed Testing: Provide seed test reports including purity, germination percentage, noxious weed seed content, and date of testing.

1.6 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data: For all turf materials including seed mixes, sod, fertilizers, and soil amendments.
 - 2. Samples:
 - (1) Provide representative samples of seed mix, minimum 100 grams.
 - (2) Provide sod sample, minimum 12 inches by 12 inches.
 - 3. Shop Drawings: Layout plan showing areas of turf installation, seed mix types, and installation methods.
 - 4. Certificates: Certification of seed analysis and sod source.
 - 5. Manufacturer's Installation Instructions for each product.
- B. Informational Submittals:
 - 1. Soil Test Reports.
 - 2. Turf Establishment Plan including watering schedule, fertilization plan, and maintenance procedures.
 - 3. Maintenance Data including instructions for maintenance during warranty period.
 - 4. Warranty Documentation.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Delivery:
 - 1. Deliver seed in original sealed containers with labels intact indicating species, purity, germination rates, and testing date.
 - 2. Deliver sod fresh, cut within 24 hours prior to delivery, and maintain moisture during transport.

- B. Storage:
 - 1. Store seed in a cool, dry location protected from sunlight, moisture, and pests.
 - 2. Store sod on pallets or similar supports to prevent contamination and moisture loss.
- C. Handling:
 - 1. Handle seed and sod carefully to prevent damage or contamination.
 - 2. Protect soil and seedbeds from compaction and contamination prior to installation.

1.9 WARRANTY

- A. Provide a minimum 12-month warranty on turf and grasses covering establishment and maintenance.
- B. Warranty shall cover replacement or repair of turf that fails to thrive due to installation or material defects, including failure to meet specified density, uniformity, and coverage criteria.
- C. Provide manufacturer's standard warranty for seed and sod materials.
- D. Provide installer's warranty covering workmanship for the duration of the maintenance period.

PART 2 – PRODUCTS

2.1 TURFGRASS SEED

- A. Seed Mix: Provide seed mix as indicated on drawings and specified in contract documents.
- B. Species and Varieties: Use only species and cultivars adapted to local climate and soil conditions.
- C. Seed Purity and Germination:
 - 1. Minimum purity 95% by weight.
 - 2. Minimum germination 80% for all species.
- D. Noxious Weed Seed Content: Comply with Federal and State regulations; maximum 0.01% by weight.
- E. Seed Analysis Report: Submit current seed test analysis with each shipment.

2.2 TURFGRASS SOD

- A. Sod Type: Provide sod of species and cultivars specified in contract documents.
- B. Quality:
 - 1. Sod shall be free of weeds, diseases, and pests.
 - 2. Sod thickness shall be 1 to 1.5 inches including soil and root mat.
 - 3. Sod shall be harvested within 24 hours prior to installation.
- C. Source: Use sod grown in similar climatic and soil conditions to project site.
- D. Moisture Content: Sod must be moist at delivery and maintained until installation.

2.3 SOIL AMENDMENTS

- A. Fertilizers:
 - 1. Provide commercial fertilizers conforming to ASTM standards and state regulations.
 - 2. Use slow-release nitrogen fertilizers with minimum analysis of 10-10-10 or as specified.
- B. Organic Matter:
 - 1. Provide composted organic matter free of contaminants, weed seeds, and pathogens.
- C. Lime and pH Adjusters:

1. Provide agricultural lime or other pH adjusting materials as required by soil tests.

2.4 MULCH MATERIALS

- A. Provide straw mulch or other approved erosion control mulch to protect seeded areas.
- B. Mulch shall be free of noxious weeds and contaminants.

2.5 WATER

- A. Provide potable water for irrigation and establishment of turf.

2.6 MANUFACTURERS

- A. Turfgrass Producers:
 1. Scotts Miracle-Gro Company
 2. Pennington Seed, Inc.
 3. Jonathan Green, Inc.
 4. Berger Seeds
 5. Sun City Turf, LLC
- B. Fertilizer Manufacturers:
 1. The Andersons, Inc.
 2. Haifa Group
 3. Lesco, Inc.
- C. Soil Amendment Suppliers:
 1. Black Kow Compost
 2. Earthgro Compost
 3. Local approved compost suppliers

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that soil preparation, grading, and drainage work are complete and conform to requirements.
- B. Verify that soil pH and nutrient levels comply with recommendations from soil testing.
- C. Do not proceed with turf installation until unsatisfactory conditions are corrected.

3.2 PREPARATION

- A. Seedbed Preparation:
 1. Loosen soil to minimum 4 inches depth using tilling or rototilling equipment.
 2. Remove debris, stones larger than 1 inch, roots, and other materials that may interfere with turf growth.
 3. Incorporate soil amendments and fertilizers as recommended by soil test results.
 4. Grade and smooth seedbed to eliminate low spots and provide positive drainage.
 5. Lightly compact seedbed surface to firm but not hard condition.
- B. Sod Bed Preparation:

1. Prepare soil as for seedbed preparation.
2. Ensure smooth and firm surface to receive sod with no voids.

3.3 INSTALLATION

- A. 3.3.1 Seeding:
 1. Apply seed at rates specified by manufacturer or contract documents.
 2. Use mechanical spreaders for uniform distribution.
 3. Lightly rake or drag seeded area to incorporate seed into soil 0.25 to 0.5 inches deep.
 4. Apply mulch immediately after seeding to protect seed and retain moisture.
- B. Hydroseeding (If Specified):
 1. Prepare slurry of seed, fertilizer, mulch, tackifier, and water per manufacturer's instructions.
 2. Apply slurry uniformly with hydroseeding equipment at specified rates.
- C. Sodding:
 1. Lay sod in staggered rows with tight joints; avoid gaps or overlapping.
 2. Roll sod immediately after installation to ensure contact with soil.
 3. Trim sod edges neatly and fill voids with soil or sod pieces.
- D. Fertilization:
 1. Apply starter fertilizer at installation as recommended by soil test.
- E. Watering:
 1. Begin watering immediately after installation to maintain soil moisture adequate for germination and establishment.
 2. Follow watering schedule as per Turf Establishment Plan.

3.4 FIELD QUALITY CONTROL

- A. Inspection:
 1. Inspect turf areas weekly during establishment for coverage, density, and weed invasion.
 2. Identify and correct areas of poor growth or damage.
- B. Acceptance Criteria:
 1. Turf shall be healthy, uniformly dense, free of bare or thin spots greater than 5% of any area.
 2. Weeds shall not exceed 10% of turf area by visual estimate.

3.5 MAINTENANCE

- A. Provide maintenance for minimum 12 months after installation including watering, mowing, fertilization, weed control, and pest management.
- B. Maintain turf at height recommended by species and cultivar guidelines.
- C. Repair or replace areas failing to meet requirements at no additional cost to Owner.

3.6 CLEANING

- A. Remove debris, excess soil, and materials from turf areas after installation and maintenance operations.
- B. Leave the site in a clean and orderly condition acceptable to the Owner.

END OF SECTION

PART 1 – GENERAL**1.1 RELATED SECTIONS**

- A. Division 01 - General Requirements
- B. 31 20 00 - Earth Moving
- C. 32 13 13 - Concrete Paving
- D. 32 84 00 - Irrigation
- E. 32 91 00 - Planting Preparation
- F. 32 92 00 - Lawns and Grasses
- G. 32 94 00 - Planting Irrigation
- H. 33 11 00 - Water Utilities
- I. 01 33 00 - Submittal Procedures
- J. 01 45 00 - Quality Control

1.2 REFERENCES, STANDARDS, AND CODES

- A. American National Standards Institute (ANSI)
 - 1. ANSI Z60.1 - American Standard for Nursery Stock
- B. American Society for Testing and Materials (ASTM)
 - 1. ASTM D5268 - Standard Guide for Planting Design and Installation
 - 2. ASTM D5970 - Standard Guide for Nursery Stock Quality
- C. American Society of Landscape Architects (ASLA)
- D. International Society of Arboriculture (ISA)
- E. U.S. Department of Agriculture (USDA) Plant Hardiness Zone Map
- F. Occupational Safety and Health Administration (OSHA) Standards
- G. Local Municipal Codes and Ordinances
- H. ANSI A300 - Tree Care Operations - Tree, Shrub, and Other Woody Plant Maintenance Standards
- I. ANSI Z133 - Safety Requirements for Arboricultural Operations

1.3 DEFINITIONS

- A. Plants - Includes trees, shrubs, ground covers, vines, grasses, and perennials specified for the project.
- B. Nursery Stock - Plants grown and maintained under specified standards for transplanting.
- C. Planting Soil - Soil or planting medium prepared or amended for plant installation.

1.4 QUALITY ASSURANCE

- A. All plants shall conform to ANSI Z60.1 standards for nursery stock size, quality, and grading.
- B. Plants shall be nursery grown, healthy, vigorous, and free of disease, pests, and defects.

- C. Inspection of plants may be performed by an independent certified arborist or landscape architect prior to delivery and installation.
- D. Plant installation shall comply with ANSI A300 standards and local regulations.
- E. Contractor shall maintain all plants in a healthy, growing condition from time of delivery through final acceptance.
- F. Provide evidence of compliance with applicable codes and standards upon request.

1.5 SUBMITTALS

A. Action Submittals

- 1. Plant List - Submit a complete list of plants including botanical and common names, quantities, sizes, and source nurseries.
- 2. Samples - Submit representative samples of plant tags, labels, and root ball wrapping materials.
- 3. Planting Schedule - Detailed schedule indicating installation sequence and timing.
- 4. Manufacturer's Data - For all planting materials, amendments, and protective devices.
- 5. Maintenance Schedule - Provide detailed maintenance instructions including watering, fertilizing, pruning, and inspection.

B. Informational Submittals

- 1. Certification of compliance with ANSI Z60.1 and other applicable standards.
- 2. Warranty documentation.
- 3. Inspection reports from certified arborist or landscape architect.
- 4. Material safety data sheets (MSDS) for fertilizers, pesticides, and soil amendments.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver plants in a healthy condition with root balls or containers intact, securely wrapped and labeled.
- B. Protect plants from damage during transportation; avoid exposure to excessive heat, cold, or drying winds.
- C. Store plants in a shaded, well-ventilated area with adequate moisture until installation.
- D. Maintain adequate watering and protection against mechanical damage, pests, and disease during storage.
- E. Handle plants by root ball or container only; do not lift by trunk, stems, or branches.

1.7 WARRANTY

- A. Provide a minimum warranty period of one (1) year from date of final acceptance.
- B. Warranty shall cover replacement or restoration of plants that fail to thrive, die, or become severely damaged.

- C. Warranty shall include labor, materials, and maintenance necessary for replacement plants.
- D. Contractor shall guarantee plant establishment and health during the warranty period.
- E. Warranty does not cover damage caused by acts of God, vandalism, or neglect by the Owner.

PART 2 – PRODUCTS

2.1 PLANTS

- A. General Requirements
 - 1. Provide plants that conform to the sizes, species, and quantities specified on the drawings and in the plant list.
 - 2. All plants shall be nursery grown, acclimated to local climate, and free from disease, pests, and mechanical injury.
 - 3. Plants shall have well-developed branch and root systems.
- B. Trees
 - 1. Provide trees meeting or exceeding ANSI Z60.1 size and quality requirements for specified caliper or height.
 - 2. Root balls shall be wrapped in burlap or wire basket unless otherwise specified.
- C. Shrubs and Ground Covers
 - 1. Provide container-grown or balled and burlapped stock with healthy root systems.
- D. Vines and Climbers
 - 1. Provide plants suitable for site conditions and support structures specified.
- E. Grasses and Perennials
 - 1. Provide plants grown in containers or plugs, acclimated to site conditions.

2.2 SOILS AND AMENDMENTS

- A. Planting Soil
 - 1. Provide planting soil mix complying with project soil analysis recommendations.
 - 2. Mix shall be free of debris, toxic substances, and foreign matter.
- B. Soil Amendments
 - 1. Provide organic compost, peat moss, sand, or other amendments as specified.
 - 2. Amend soil to improve texture, drainage, fertility, and pH as recommended by soil tests.

2.3 MULCHES

- A. Provide organic mulch such as shredded bark, wood chips, or pine needles.
- B. Mulch shall be free of weed seeds, toxic materials, and shall comply with local regulations.
- C. Apply mulch uniformly at specified depth.

2.4 FERTILIZERS AND PLANTING AIDS

- A. Provide fertilizers formulated for new planting applications with slow-release characteristics.
- B. Provide mycorrhizal inoculants, soil conditioners, or other planting aids as specified.

2.5 PLANT PROTECTION DEVICES

- A. Provide tree stakes, guying, wrapping, and guards as needed to protect plants during and after installation.
- B. Materials shall be durable, weather-resistant, and non-damaging to plants.

2.6 MANUFACTURERS

- A. Plants and Materials Suppliers
 - 1. Proven Winners®
 - 2. Monrovia Nursery Company
- B. Frank Schmidt & Son Co.
 - 1. Ball Horticultural Company
 - 2. Arbor Day Foundation Nurseries
 - 3. Local Certified Native Plant Nurseries (as approved)
- C. Soil Amendments and Fertilizers
 - 1. Espoma Organic Products
 - 2. Scotts Miracle-Gro Company
 - 3. BioTerra Soil Products
- D. Mulches
 - 1. Northwest Bark
 - 2. Pine Bark Nuggets Inc.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that grading, drainage, and irrigation systems are completed and functional prior to planting.
- B. Inspect planting areas for compliance with specified soil preparation requirements.
- C. Notify Architect or Landscape Architect of any discrepancies or conditions detrimental to plant growth.

3.2 PREPARATION

- A. Prepare planting soil as specified in Section 32 91 00 - Planting Preparation.

- B. Loosen subgrade and incorporate soil amendments thoroughly.
- C. Verify moisture content of planting soil is adequate for planting operations.

3.3 PLANT INSTALLATION

- A. Planting Procedures
 - 1. Plant trees, shrubs, and other plants in accordance with ANSI Z60.1 and ASTM D5268 guidelines.
 - 2. Dig holes large enough to accommodate root systems without crowding or deformation.
 - 3. Place plants plumb and at proper depth; backfill with amended planting soil.
 - 4. Water plants thoroughly after planting to eliminate air pockets.
- B. Tree Installation
 - 1. Remove wire baskets and burlap from root balls as much as possible without disturbing roots.
 - 2. Stake and guy trees as required to provide stability.
- C. Shrub, Ground Cover, and Perennial Installation
 - 1. Space plants as indicated on drawings and per nursery recommendations.
 - 2. Firm soil around roots to ensure good contact without compaction.
- D. Mulching
 - 1. Apply mulch in planting beds and around trees to specified depth, avoiding direct contact with stems or trunks.
- E. Fertilization
 - 1. Apply starter fertilizer in planting holes or as top dressing per manufacturer's instructions.

3.4 PLANT PROTECTION AND MAINTENANCE

- A. Protect plants from damage due to construction activities, pests, and environmental extremes.
- B. Provide temporary watering and irrigation as required to establish plants.
- C. Prune plants only as necessary to remove dead or damaged parts; do not over-prune.
- D. Maintain plants in a healthy growing condition until final acceptance.
- E. Remove all planting debris and unused materials from site.

3.5 FINAL ACCEPTANCE

- A. Final inspection will occur after the warranty period to verify plant health and establishment.
- B. Replace plants that have died or failed to thrive as specified in the warranty.
- C. Provide documentation of maintenance and replacement activities.

End of Section

PART 1 – GENERAL

1.1 RELATED SECTIONS

- A. Division 01 – General Requirements
- B. Section 31 23 00 – Excavation and Fill
- C. Section 31 23 33 – Trenching
- D. Section 33 46 00 – Subdrainage Systems
- E. Section 33 46 13 – Storm Drainage Piping and Appurtenances
- F. Section 33 05 13 – Common Work Results for Utilities
- G. Section 31 05 16 – Geotextiles
- H. Section 32 13 13 – Concrete Paving
- I. Section 33 11 00 – Water Utilities
- J. Section 33 05 23 – Water Utilities Testing

1.2 REFERENCES, STANDARDS, AND CODES

- A. American Association of State Highway and Transportation Officials (AASHTO)
 - 1. AASHTO M 252 – Corrugated Polyethylene Drainage Pipe
 - 2. AASHTO M 294 – Corrugated Polyethylene Drainage Pipe (Dual Wall)
- B. American Society for Testing and Materials (ASTM)
 - 1. ASTM C76 – Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
 - 2. ASTM C494 – Chemical Admixtures for Concrete
 - 3. ASTM D3034 – Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
 - 4. ASTM F2306 – Polypropylene (PP) Pipe
 - 5. ASTM D1785 – PVC Plastic Pipe, Schedules 40, 80, and 120
 - 6. ASTM D2321 – Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
- C. ASTM C443 – Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
- D. American Water Works Association (AWWA)
 - 1. AWWA C900 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In.
 - 2. AWWA C905 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In.
- E. National Association of Sewer Service Companies (NASSCO)
 - 1. PACP – Pipeline Assessment Certification Program
- F. Occupational Safety and Health Administration (OSHA)
 - 1. OSHA 29 CFR Part 1926 – Safety and Health Regulations for Construction
- G. International Building Code (IBC)
- H. National Fire Protection Association (NFPA) Standards as applicable
- I. State and Local Codes and Regulations – Compliance as applicable
- J. Manufacturer’s published installation and product standards and instructions

1.3 DEFINITIONS

- A. Storm Drainage Utilities: Systems and components including pipes, catch basins, manholes, inlets, junction boxes, and associated appurtenances used to collect, convey, and discharge stormwater.
- B. Gravity Flow System: Storm drainage system relying on gravity for water conveyance without mechanical pumping.
- C. Appurtenances: Components such as inlets, catch basins, manholes, junction boxes, and other fittings associated with storm drainage piping.

1.4 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installer shall have a minimum of 5 years' experience installing storm drainage utilities of similar scope and complexity.
 - 2. Manufacturer qualifications shall include a minimum of 10 years producing storm drainage products meeting specified standards.
- B. Testing and Inspection:
 - 1. Perform visual inspections and field testing per ASTM and AASHTO standards to verify compliance.
 - 2. Contracting entity shall retain an independent third-party testing agency for verifying materials and installation quality.
- C. Mock-Up:
 - 1. When requested by the Engineer, provide a representative mock-up of pipe installation and jointing methods for approval prior to full-scale installation.
- D. Compliance:
 - 1. All materials and installation methods shall comply with referenced standards, codes, and manufacturer instructions.
 - 2. Installation shall comply with OSHA safety standards including trench safety and confined space entry.

1.5 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data: Submit manufacturer's technical data, specifications, installation instructions, and certifications for all storm drainage products and materials.
 - 2. Shop Drawings: Submit detailed drawings indicating pipe layout, sizes, slopes, invert elevations, appurtenance locations, joint types, and materials.
 - 3. Quality Control Submittals: Submit proposed testing procedures and certifications for materials and installation.
 - 4. Samples: Provide samples of pipe materials, joint gaskets, and other critical components upon request.

5. Warranties: Submit manufacturer's warranties and installer's warranties as specified. Informational Submittals:
6. Inspection Reports: Submit field inspection reports and test results for materials and installation.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery:
 1. Deliver materials in manufacturer's original packaging, labeled with product identification and batch numbers.
 2. Schedule delivery to minimize storage time on site and prevent damage.
- B. Storage:
 1. Store pipes and appurtenances on level surfaces, elevated above ground to prevent contamination and damage.
 2. Protect stored materials from sunlight, moisture, dirt, and impact damage in accordance with manufacturer's recommendations.
- C. Handling:
 1. Handle materials carefully to avoid damage to pipe ends, joints, and coatings.
 2. Use lifting devices designed to support pipe weight evenly and prevent deformation.
 3. Do not drop or roll pipe down slopes or against hard surfaces.

1.7 WARRANTY

- A. Manufacturer's Warranty:
 1. Provide manufacturer's standard warranty against defects in materials and workmanship for a minimum period of 10 years from date of substantial completion.
- B. Installer's Warranty:
 1. Installer shall warrant all workmanship and installation for a minimum period of 2 years from date of acceptance by Owner.
 2. Warranty shall include repair or replacement of defective components and restoration of disturbed areas.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Advanced Drainage Systems, Inc.
- B. Charlotte Pipe and Foundry Company
- C. JM Eagle
- D. Forterra, Inc.
- E. Hanson Pipe & Products

- F. McWane, Inc.
- G. Smith-Blair, Inc.
- H. Hancor, Inc.
- I. National Pipe & Plastics, Inc.
- J. CertainTeed Corporation

2.2 PIPE MATERIALS

- A. High-Density Polyethylene (HDPE) Pipe:
 - 1. Corrugated HDPE pipe conforming to AASHTO M 252 or M 294.
 - 2. Pipe diameters and wall thickness as indicated on drawings.
 - 3. Joints: Integral bell and spigot with gasket per ASTM D3212.
- B. Polyvinyl Chloride (PVC) Pipe:
 - 1. PVC pipe for storm drainage per ASTM D3034 or ASTM F679.
 - 2. Joints: Elastomeric gasketed joints conforming to ASTM D3212 and ASTM F477.
- C. Reinforced Concrete Pipe (RCP):
 - 1. Reinforced concrete pipe conforming to ASTM C76.
 - 2. Joints: Rubber gasket joints per ASTM C443.
- D. Polypropylene (PP) Pipe:
 - 1. Polypropylene pipe complying with ASTM F2306 for storm drainage applications.
 - 2. Joints: Heat-fused or gasketed joints as recommended by manufacturer.
- E. Ductile Iron Pipe:
 - 1. Ductile iron pipe meeting AWWA C151, with protective coatings per AWWA C104.
 - 2. Joints: Mechanical or push-on per AWWA C111.

2.3 APPURTENANCES

- A. Manholes:
 - 1. Precast concrete manholes conforming to ASTM C478.
 - 2. Round or rectangular as indicated.
 - 3. Include watertight gaskets and watertight covers where specified.
- B. Catch Basins and Inlets:
 - 1. Precast concrete or polymer concrete units complying with ASTM C913 or equivalent.
 - 2. Frames and grates cast iron, meeting ASTM A48 Class 30B.
- C. Junction Boxes:
 - 1. Precast concrete or polymer concrete units as indicated.
 - 2. Include watertight covers if specified.
- D. Pipe Fittings:

1. Provide fittings compatible with pipe materials and meeting applicable ASTM or AWWA standards.
- E. Joint Materials:
 1. Gaskets shall be elastomeric, resistant to chemical and environmental degradation.
 2. Joint sealants as recommended by manufacturer.

2.4 BEDDING AND BACKFILL MATERIALS

- A. Provide bedding material conforming to Section 31 23 00 and local standards.
- B. Material shall be clean, free-draining granular material with particle sizes and gradation per project requirements.
- C. Backfill shall be free of debris, organic matter, and comply with compaction requirements.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify trench excavations, bedding conditions, and subgrade are ready to receive storm drainage utilities.
- B. Notify Engineer of any unsuitable conditions before installation.
- C. Verify dimensions, elevations, and locations of utilities with layout drawings.

3.2 PREPARATION

- A. Install geotextile fabric as required under bedding and backfill.
- B. Provide dewatering and maintain dry trench conditions during installation.
- C. Verify pipe materials and accessories match approved submittals.

3.3 PIPE INSTALLATION

- A. Install pipe in accordance with manufacturer's instructions, ASTM D2321, and AASHTO standards.
- B. Maintain pipe alignment, grade, and invert elevations as indicated.
- C. Assemble joints using specified gaskets and lubricants.
- D. Do not exceed allowable bending radii for flexible pipes.
- E. Provide necessary supports or cradles for rigid pipes where required.
- F. Avoid damage to pipe during placement; replace damaged sections immediately.
- G. Temporarily plug pipe ends when work is not in progress to prevent debris entry.

3.4 INSTALLATION OF APPURTENANCES

- A. Set precast manholes, catch basins, inlets, and junction boxes on prepared bedding.
- B. Align and level appurtenances to design elevations.
- C. Seal joints between precast units with watertight gaskets or approved sealants.
- D. Install frames, covers, and grates securely and flush with adjacent surfaces.
- E. Provide watertight seals for manhole covers where specified.

3.5 BEDDING AND BACKFILL

- A. Place bedding material in uniform layers not exceeding 6 inches compacted thickness.
- B. Compact bedding to 95 percent of maximum dry density per ASTM D698 or as specified.
- C. Backfill pipe zone with select material and compact to specified density.
- D. Place final backfill in layers and compact as specified in Section 31 23 00.

3.6 FIELD QUALITY CONTROL

- A. Inspect all joints for proper assembly and tightness before backfilling.
- B. Conduct leakage and infiltration tests as specified:
 - 1. Low-pressure air test for concrete pipe or as specified in project documents.
 - 2. Mandrel or deflection test for flexible pipe.
- C. Repair or replace defective pipe sections or joints as directed.
- D. Provide test reports and certifications to Engineer.

3.7 CLEANING

- A. Remove debris, dirt, and construction materials from inside pipe and appurtenances.
- B. Flush system with water to clear sediment before final acceptance.
- C. Ensure system is free flowing and unobstructed.

3.8 PROTECTION

- A. Protect installed storm drainage utilities from damage during remaining construction.
- B. Repair damage immediately at no additional cost to Owner.

3.9 MAINTENANCE

- A. Maintain storm drainage utilities until final acceptance.
- B. Provide emergency repairs if damage or failure occurs during maintenance period.

END OF SECTION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include but are not limited to:
 - 1. Section 31 23 00 – Excavation and Fill
 - 2. Section 31 23 33 – Trenching
 - 3. Section 33 05 13 – Underground Utility Inspection and Testing
 - 4. Section 33 05 16 – Utility Backfilling
 - 5. Section 33 46 00 – Storm Drainage Structures
 - 6. Section 33 11 00 – Water Utilities
 - 7. Section 32 13 13 – Concrete Paving
 - 8. Section 31 05 19 – Geotextiles for Drainage and Filtration

1.2 SUMMARY

- A. This Section includes furnishing and installing storm utility drainage piping systems including pipe, fittings, accessories, and related appurtenances for stormwater conveyance.
- B. Types of piping included:
 - 1. Reinforced concrete pipe (RCP)
 - 2. High-density polyethylene (HDPE) pipe
 - 3. Polyvinyl chloride (PVC) pipe
 - 4. Ductile iron pipe (DIP)
 - 5. Corrugated metal pipe (CMP)
- C. Work includes:
- D. Excavation, bedding, and backfill for piping
- E. Pipe installation and jointing
- F. Testing and inspection
- G. Connections to structures and appurtenances

1.3 DEFINITIONS

- A. Storm Utility Drainage Piping: Piping designed to collect and convey stormwater away from surfaces and structures to a discharge point or stormwater management system.

1.4 REFERENCES AND STANDARDS

- A. The following codes, standards, and publications form a part of this specification to the extent referenced.

1. American Society for Testing and Materials (ASTM)
 - a) ASTM A536 – Standard Specification for Ductile Iron Castings
 - b) ASTM C76 – Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
 - c) ASTM D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
 - d) ASTM D3034 – Standard Specification for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings
 - e) ASTM D3350 – Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
 - f) ASTM D1248 – Standard Specification for Polyethylene Plastics Molding and Extrusion Materials
 - g) ASTM F2306 – Standard Specification for Corrugated Polyethylene Drainage Pipe
 - h) ASTM A746 – Standard Specification for Ductile Iron Gravity Sewer Pipe
2. American Association of State Highway and Transportation Officials (AASHTO)
 - a) AASHTO M 252 – Corrugated Polyethylene Drainage Pipe
 - b) AASHTO M 36 – Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains
3. American Water Works Association (AWWA)
 - a) AWWA C151 – Ductile-Iron Pipe, Centrifugally Cast, for Water
 - b) AWWA C600 – Installation of Ductile-Iron Water Mains and Their Appurtenances
4. National Association of Sewer Service Companies (NASSCO)
 - a) Pipeline Assessment Certification Program (PACP) – For inspection and condition assessment
5. International Plumbing Code (IPC)
6. International Building Code (IBC)
7. Occupational Safety and Health Administration (OSHA) Standards
8. Local jurisdictional requirements and standards.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Use manufacturers regularly engaged in manufacturing storm drainage piping products of types, materials, and sizes required, with minimum 5 years documented experience.

B. Installer Qualifications:

1. Employ experienced installers with minimum 3 years experience installing storm utility drainage piping.
2. Installer shall be familiar with manufacturer's installation instructions and comply fully.

C. Codes and Standards Compliance:

1. Comply with applicable codes, standards, and regulations referenced in this Section and as required by authorities having jurisdiction.
- D. Testing and Inspection:
1. Perform testing and inspection as specified in Part 3 and as required by regulatory agencies.
 2. Testing shall be conducted by qualified independent testing agency.

1.6 SUBMITTALS

- A. Action Submittals:
1. Product Data: Provide manufacturer's catalog sheets, specifications, and installation instructions for each type of pipe, fittings, and accessories.
 2. Shop Drawings: Include layout drawings showing pipe routing, sizes, slopes, joint details, and connections to structures.
 3. Samples: Submit samples of pipe materials, jointing materials, and accessories for approval.
 4. Qualification Statements: Installer and manufacturer qualifications.
- B. Informational Submittals:
1. Certificates: Material test reports and certifications verifying compliance with specified standards.
 2. Test Reports: Results of pipe pressure, leakage, and deflection tests.
 3. Inspection Reports: Inspection records by independent agencies.
 4. Warranty documentation.
 5. Manufacturer's installation instructions.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original unopened packaging with identification labels intact.
- B. Store pipes and fittings on clean, level surfaces, protected from dirt, moisture, direct sunlight, and physical damage.
- C. Handle pipe with equipment or methods that prevent damage including gouges, cracks, or deformation.
- D. Protect pipe ends with end caps or plugs to prevent entry of dirt or debris during storage and installation.
- E. Store jointing materials as recommended by manufacturer, protecting from moisture and contamination.

1.8 WARRANTY

- A. Provide manufacturer's standard warranty covering defects in materials and workmanship for a minimum period of 10 years from date of substantial completion.

- B. Installer shall warrant installation workmanship for a period of 2 years from date of acceptance.
- C. Warranty shall include repair or replacement of defective piping, joints, or related components at no cost to the Owner.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Reinforced Concrete Pipe:
 - 1. Oldcastle Infrastructure
 - 2. Hanson Pipe & Precast
 - 3. CRH Americas Materials
- B. High-Density Polyethylene (HDPE) Pipe:
 - 1. AGRU America
 - 2. Advanced Drainage Systems (ADS)
 - 3. Chevron Phillips Chemical Company LP
- C. Polyvinyl Chloride (PVC) Pipe:
 - 1. JM Eagle
 - 2. Charlotte Pipe and Foundry Company
 - 3. WL Plastics
- D. Ductile Iron Pipe:
 - 1. U.S. Pipe
 - 2. McWane Ductile
 - 3. American Cast Iron Pipe Company (ACIPCO)
- E. Corrugated Metal Pipe (CMP):
 - 1. Contech Engineered Solutions
 - 2. Armtec
 - 3. National Corrugated Steel Pipe Company

2.2 MATERIALS

- A. Reinforced Concrete Pipe (RCP):
 - 1. Comply with ASTM C76, Class III or heavier as indicated.
 - 2. Pipe shall be reinforced with steel conforming to ASTM A615 Grade 60.
- B. High-Density Polyethylene (HDPE) Pipe:
 - 1. Comply with ASTM F2306 and AASHTO M 252.
 - 2. Pipe shall be smooth interior, corrugated exterior profile unless otherwise indicated.
 - 3. Minimum cell classification shall comply with ASTM D3350 PE4710.
- C. Polyvinyl Chloride (PVC) Pipe:
 - 1. Comply with ASTM D3034 for SDR 35 or as indicated.

2. Pipe and fittings shall be manufactured from virgin PVC resin meeting ASTM D1784.
- D. Ductile Iron Pipe (DIP):
1. Comply with AWWA C151 and ASTM A746.
 2. Pipe shall be cement lined and seal coated per AWWA C104.
- E. Corrugated Metal Pipe (CMP):
1. Comply with AASHTO M 36.
 2. Pipe shall be metallic coated (galvanized or aluminized) per ASTM A123 or ASTM A849.
- F. Joints and Fittings:
1. Provide jointing systems recommended by pipe manufacturer including gasketed bell-and-spigot, restrained joints, or welded joints as applicable.
 2. Provide fittings and adapters compatible with pipe materials and system design pressures.

2.3 ACCESSORIES

- A. Couplings, Adapters, and Transition Fittings:
1. Provide corrosion-resistant couplings compatible with pipe materials and sizes.
- B. Pipe Bedding and Surround Materials:
1. Provide granular bedding material conforming to Section 31 23 00 and local requirements.
- C. Tracer Wire and Warning Tape:
1. Provide continuous tracer wire for all non-metallic piping per local utility requirements.
 2. Provide detectable warning tape above piping as specified in Section 31 05 13.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that trenching, bedding, and structural conditions are ready to receive piping.
- B. Inspect pipe materials for damage before installation; do not install damaged pipe.
- C. Verify invert elevations, slopes, and alignment per drawings.

3.2 PREPARATION

- A. Excavate trenches to lines and grades indicated. Maintain trench bottom free of loose or soft material.
- B. Place bedding material as specified and compact to required density.

3.3 INSTALLATION

- A. Install pipe and fittings in accordance with manufacturer's instructions, ASTM D2321, and AWWA C600 where applicable.
- B. Maintain minimum cover depth as required by code or project documents.
- C. Lay pipe true to alignment and grade, with uniform slope to ensure positive drainage.
- D. Join pipe using recommended jointing method ensuring watertight connections.
- E. Install tracer wire continuously with non-metallic pipe and provide access points at intervals.
- F. Provide adequate support and embedment to prevent displacement or damage.
- G. Install detectable warning tape minimum 12 inches above pipe crown.
- H. Provide protection from floating or shifting during backfilling.

3.4 BACKFILLING

- A. Backfill trenches in layers not exceeding 8 inches, compacting each layer to specified density.
- B. Protect pipe from damage during backfilling operations.

3.5 FIELD QUALITY CONTROL

- A. Inspection and Testing:
 - 1. Perform deflection testing on flexible piping (HDPE, PVC) after backfilling to verify compliance with ASTM D2321.
 - 2. Perform leakage tests on piping systems as specified in Section 33 05 13.
 - 3. Submit test reports and certification of compliance.
- B. Repair or replace defective piping or joints as directed.

3.6 CLEANING

- A. Remove debris and foreign material from piping system prior to final acceptance.
- B. Flush piping with clean water to remove sediment if required.

3.7 PROTECTION

- A. Protect installed piping from damage until final acceptance.
- B. Repair damage to pipe, joints, or coatings at no cost to Owner.

END OF SECTION 33 41 00

PART 1 – GENERAL

1.1 RELATED SECTIONS

- A. Section 31 23 00 – Excavation and Fill
- B. Section 33 05 00 – Common Work Results for Utilities
- C. Section 33 46 00 – Subdrainage Systems
- D. Section 33 70 00 – Stormwater Conveyance
- E. Section 01 33 00 – Submittal Procedures
- F. Section 01 78 00 – Closeout Submittals

REFERENCES, STANDARDS, AND CODES

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM A48 – Standard Specification for Gray Iron Castings
 - 2. ASTM A615 – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
 - 3. ASTM C478 – Standard Specification for Precast Reinforced Concrete Manhole Sections
 - 4. ASTM C506 – Standard Specification for Reinforced Concrete Circular Storm Drainage Pipe
 - 5. ASTM C923 – Standard Specification for Resilient Connectors between Reinforced Concrete Manhole Structures, Pipes, and Laterals
 - 6. ASTM D3034 – Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
 - 7. ASTM F2306 – Standard Specification for Structural-Grade Polyethylene (PE) Plastic Pipe
- B. American Association of State Highway and Transportation Officials (AASHTO)
 - 1. AASHTO M 170 – Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
 - 2. AASHTO M 198 – Standard Specification for Reinforced Concrete Arch Pipe, Storm Drain, and Sewer Pipe
- C. National Association of Sewer Service Companies (NASSCO)
 - 1. NASSCO PACP – Pipeline Assessment Certification Program Standards
- D. National Fire Protection Association (NFPA)
 - 1. NFPA 820 – Standard for Fire Protection in Wastewater Treatment and Collection Facilities (as applicable)
- E. Occupational Safety and Health Administration (OSHA)
 - 1. OSHA 29 CFR Part 1926 – Safety and Health Regulations for Construction
- F. Local, State, and Federal Codes
 - 1. Local municipal storm drainage and sewer codes
 - 2. State Department of Transportation (DOT) standards
 - 3. Environmental Protection Agency (EPA) regulations on stormwater management

4. Other Industry Standards
5. American Concrete Institute (ACI) 318 – Building Code Requirements for Structural Concrete
6. American Concrete Institute (ACI) 350 – Environmental Engineering Concrete Structures
7. Precast/Prestressed Concrete Institute (PCI) Design Handbook

1.3 SUMMARY

- A. This section includes requirements for the materials, fabrication, installation, and testing of storm drainage structures including manholes, catch basins, inlets, junction boxes, and related accessories.
- B. Types of structures include precast reinforced concrete, cast-in-place concrete, polymer concrete, and plastic drainage structures.
- C. Provide all labor, materials, equipment, and services necessary for complete and proper installation in accordance with the Contract Documents.

1.4 SUBMITTALS

- A. Action Submittals
 1. Product Data: Provide manufacturer's technical data, installation instructions, and certification of compliance with specified standards.
 2. Shop Drawings: Include layout, dimensions, reinforcement details, jointing methods, and accessories.
 3. Samples: Submit representative samples of precast concrete, polymer concrete, or plastic components as applicable.
 4. Quality Assurance Documentation: Include test reports, certifications, and inspection records.
- B. Informational Submittals
 1. Installation Procedures: Detailed step-by-step methods and sequencing.
 2. Manufacturer's Warranty: Provide warranty documentation as specified in this section.
 3. Inspection and Testing Reports: Submit results of inspections and tests conducted during fabrication and installation.
 4. Maintenance Data: Include cleaning, inspection, and repair recommendations.

1.5 QUALITY ASSURANCE

- A. Fabricators and manufacturers of precast concrete and polymer concrete structures shall have a minimum of five years' documented experience in producing storm drainage structures of similar size and complexity.
- B. Testing laboratories performing quality control testing shall be accredited by an accepted authority such as AASHTO Accreditation Program or equivalent.

- C. Comply with requirements of ASTM C478 and ACI 318 for precast reinforced concrete manholes and structures.
- D. Perform dimensional and visual inspections of precast units prior to shipment.
- E. Installer qualifications: Installers shall have at least three years of documented experience with storm drainage structure installation and shall comply with OSHA safety regulations.
- F. Conduct pre-installation conference to review procedures, safety, and quality assurance requirements.
- G. Inspection and testing during installation shall include verification of alignment, grade, joint integrity, and surface finish.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original packaging and containers, labeled with manufacturer's name, product description, and batch number.
- B. Store precast concrete units on firm, level ground with blocking to prevent damage and deformation.
- C. Protect polymer concrete and plastic components from direct sunlight and extreme temperatures during storage.
- D. Handle all materials with care to prevent chipping, cracking, or other damage. Use appropriate lifting devices and follow manufacturer's recommendations.
- E. Store gaskets, sealants, and adhesives in clean, dry locations protected from freezing and contamination.
- F. Protect installed structures from construction traffic and debris until final acceptance.

1.8 WARRANTY

- A. Provide manufacturer's standard warranty covering materials and workmanship for a minimum period of five (5) years from date of final acceptance.
- B. Installer shall warrant workmanship and installation for a minimum period of two (2) years from date of final acceptance.
- C. Warranty shall include repair or replacement of defective materials or workmanship at no cost to the Owner.
- D. Provide warranties in written form, executed by authorized representatives of manufacturer and installer.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Precast Concrete Structures:
 - 1. Oldcastle Infrastructure
 - 2. Hanson Pipe & Precast

3. CEMEX
4. Campbell Concrete
- B. Polymer Concrete Structures:
 1. Enduro Composites
 2. Endicott Polymer Products
- C. Plastic Drainage Structures (HDPE, PVC):
 1. Advanced Drainage Systems, Inc. (ADS)
 2. JM Eagle
 3. Charlotte Pipe and Foundry
- D. Accessories and Gaskets:
 1. Press-Seal Gasket Corporation
 2. Denso North America
 3. Romac Industries

2.2 MATERIALS

- A. Precast Reinforced Concrete
 1. Concrete: Minimum compressive strength 4000 psi at 28 days, air-entrained, with admixtures as required for durability.
 2. Reinforcement: ASTM A615 Grade 60 deformed steel bars or welded wire fabric conforming to ACI 318.
 3. Joints: Rubber gaskets conforming to ASTM C443 or resilient connectors conforming to ASTM C923.
- B. Polymer Concrete
 1. Resin matrix: Polyester or epoxy resin system resistant to chemicals commonly found in stormwater.
 2. Aggregate: Silica sand, quartz, or other inert materials meeting manufacturer specifications.
- C. Plastic Structures
 1. Pipe and fittings: HDPE or PVC conforming to ASTM D3034 or ASTM F2306.
 2. Joints: Flexible gasketed joints with water-tight seals.
- D. Cast-in-Place Concrete
 1. Concrete: Minimum 4000 psi compressive strength at 28 days.
 2. Reinforcement: ASTM A615 Grade 60 or as specified.
- E. Frames and Covers
 1. Material: Cast iron conforming to ASTM A48 Class 30B or ductile iron conforming to ASTM A536.
 2. Design: Load ratings as specified by AASHTO HS-20 or as required by project.
 3. Finish: Manufacturer's standard protective coating to resist corrosion.
- F. Sealants and Joint Materials
 1. Sealants: Polyurethane or polysulfide sealants compatible with adjacent materials and resistant to stormwater constituents.

2. Gaskets: Neoprene, rubber, or other elastomeric materials meeting ASTM standards.

2.3 FABRICATION

- A. Precast units shall be fabricated in accordance with ASTM C478 and PCI guidelines.
- B. Provide lifting inserts and points as required to facilitate safe handling and installation.
- C. Ensure all joints are properly formed and gaskets installed per manufacturer instructions.
- D. Frames and covers shall be manufactured to precise dimensions to ensure proper fit and function.
- E. Polymer concrete units shall be cured and finished to provide smooth, impervious surfaces.
- F. Plastic structures shall be fabricated in continuous lengths or sections as specified, with jointing systems tested for watertightness.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that excavations are complete and dimensions, elevations, and bedding materials conform to project requirements.
- B. Inspect delivered materials for damage, defects, and compliance with Contract Documents.
- C. Notify the Architect/Engineer of any discrepancies or conditions detrimental to installation.

3.2 PREPARATION

- A. Prepare bedding surfaces to provide uniform support and prevent differential settlement.
- B. Install bedding material in accordance with Section 31 23 00 and compact to specified density.
- C. Ensure adjacent pipes and utilities are installed and tested prior to structure installation.

3.3 INSTALLATION

- A. Install storm drainage structures in accordance with manufacturer's instructions, ASTM standards, and Contract Documents.
- B. Maintain alignment, grade, and elevation within tolerances specified.
- C. Set precast units plumb and true; use shims and blocking as necessary.
- D. Install joint gaskets and sealants to provide watertight connections; verify integrity by visual inspection and testing if required.
- E. Place cast-in-place concrete structures with proper formwork, reinforcement, and curing practices.

- F. Install frames and covers securely; adjust to finished grade and ensure smooth operation.
- G. Backfill around structures in layers not exceeding 8 inches loose depth; compact to specified density without damaging structures.
- H. Protect installed structures from damage during subsequent construction activities.

3.4 FIELD QUALITY CONTROL

- A. Inspect installed structures for alignment, grade, plumbness, and joint integrity.
- B. Conduct leakage tests on manholes and inlets as specified or as directed by Engineer.
- C. Verify frame and cover load ratings and installation.
- D. Document inspection results and test reports; submit to Architect/Engineer for review.
- E. Correct deficiencies promptly and retest as required.

3.5 CLEANING

- A. Remove construction debris and excess materials from inside and around storm drainage structures.
- B. Flush pipe and structures to remove sediment and foreign matter prior to final acceptance.
- C. Provide maintenance instructions to Owner for periodic inspection and cleaning.

3.6 PROTECTION

- A. Protect completed storm drainage structures from damage by construction activities and weather until final acceptance.
- B. Repair or replace damaged components at no additional cost to Owner.

END OF SECTION 33 49 00