LOCKEBY & ASSOCIATES.

PROJECT MANUAL

OKSI

Intelligent. Adaptive. Integrated.

Jacksonville, Arkansas

Permit Set

Prepared By:
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Lockeby & Associates, Inc. Project Number: 26-19

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SECTION 01 10 00
SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: 26-19 OKSI

B. Architect's Name: Lockeby & Associates Inc.

C. The Project consists of the Remodel of OKSI Campus of Located in Jacksonville AR.

1.02 CONTRACT DESCRIPTION

1.03 OWNER OCCUPANCY

A. Owner intends to occupy the Project upon Substantial Completion.

B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

C. Schedule the Work to accommodate Owner occupancy.

1.04 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings.
   1. Locate and conduct construction activities in ways that will limit disturbance to site.

B. Provide access to and from site as required by law and by Owner:
   1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
   2. Do not obstruct roadways, sidewalks, or other public ways without permit.

END OF SECTION 01 10 00

SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Coordination and project conditions.

B. Pre-construction meeting.

C. Pre-installation meeting.

D. Progress meetings.

E. Construction progress schedule.

F. Weather days

G. Submittals.

1.02 COORDINATION AND PROJECT CONDITIONS

A. Coordinate scheduling, submittals and Work of the various sections of the Specification Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.

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

C. Coordinate completion and clean-up of Work of separate sections on a daily basis and in final preparation for the Substantial Completion inspection.

D. Coordinate routine and special schedule requirements with the Owner regarding access to the site. Minimize disruption of existing on-site daily activities.

1.03 PROGRESS MEETINGS.

A. Meetings will be set at pre-construction meeting

1.04 CONSTRUCTION PROGRESS SCHEDULE.

A. Contractor to provide a gantt chart with milestone for Owner and Architect to monitor progress of project

1.05 CONTRACTOR'S DAILY REPORTS.

A. Contractor to keep a daily log of weather, subcontractors and personnel on site for the day.

1.06 PROGRESS PHOTOGRAPHS.

A. Contractor to keep photos of major milesontes

1.07 SUBMITTALS FOR REVIEW, INFORMATION, AND PROJECT CLOSEOUT.

1.08 NUMBER OF COPIES OF SUBMITTALS.

A. Contractor is to submit 1 electric copy of submittals PDF's are prefred.

B. Constractor to submit one physical sample for color review and color board for owner review.

1.09 REQUESTS FOR INTERPRETATION (RFI) PROCEDURES.

A. Contractor to submit RFI for any unforseeable issues via email

B. Architect will respond in a timely manner after review.

1.10 SUBMITTAL PROCEDURES.

A. Contractor to submit via email.

1.11 RELATED REQUIREMENTS

A. Section 00 72 00 - General Conditions: Dates for applications for payment.

B. Section 00 73 00 - Supplementary Conditions: Duties of the Construction Manager.

C. Section 01 60 00 - Product Requirements: General product requirements.

D. Section 01 70 00 - Execution and Closeout Requirements: Additional coordination requirements.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRE-CONSTRUCTION MEETING

A. A-E will schedule a pre-construction meeting after the completed Contract Agreement has been approved by Arkansas Building Authority.

B. Attendance Required: Owner, A-E, Arkansas Building Authority representative and Contractor representatives.

C. Agenda:
   1. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal requests, Change Orders and Contract closeout procedures.
   2. Scheduling.

3.02 PRE-INSTALLATION MEETING

A. When required in individual specification sections, convene a pre-installation meeting at the site prior to commencing work of the section.

B. Required attendance of parties directly affecting or affected by Work of the specific section.

3.03 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
   1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Information (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
   2. Paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.
   3. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

B. Submittal Service: The selected service is:

C. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

3.04 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work at maximum bi-monthly intervals.

B. Attendance Required: Job superintendent,Owner, Architect, as appropriate to agenda topics for each meeting.

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

3.05 CONSTRUCTION PROGRESS SCHEDULE

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

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

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

D. Submit updated schedule with each Application for Payment.

E. Distribute copies of reviewed schedules to Project site file, subcontractors, suppliers, and other concerned parties.

F. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

G. Submit a computer generated horizontal bar with separate line for each major portion of Work or operation, identifying first work day of each week.

H. Indicate estimated percentage of completion for each item of Work at each submission.

I. Revisions to Schedules:
   1. Indicate progress of each activity to date of submittal, and projected completion date of each activity.
   2. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.
   3. Provide narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect, including the effect of changes on schedules of separate contractors.

3.06 DAILY CONSTRUCTION REPORTS

A. Prepare a daily construction report recording the following information concerning events at Project site and project progress:
   1. Date.
   2. High and low temperatures, and general weather conditions.
   3. Safety, environmental, or industrial relations incidents.
   4. Meetings and significant decisions.
   5. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
   6. Testing and/or inspections performed.
   7. Signature of Contractor's authorized representative.

3.07 WEATHER DAYS

A. Completion date shown on the Bid Form, Section 00 41 13, does not include allowance for adverse weather delays. Section 00 73 00 Supplemental General Conditions lists averge rainfall over the past 5 years those days are to be included in base bid. Any additional inclement weather day above the listed days are to be submitted at the end of the month with the pay application for the architects review. Approved days will be add to the substantial completion The contractor may request additional time based upon delays resulting from adverse weather which prohibits the safe and proper execution of the work.

B. Adverse weather includes but is not necessarily limited to the following events:
   1. Excessive precipitation including, rain, fog, freezing rain, snow, sleet or hail where the work area is unsafe due to slip or fall hazards, or the work surfaces are unsuitable for the installation of the work in accordance with the manufacturer’s installation requirements. Precipitation delays can extend beyond the occurrence of the precipitation event when the hazardous conditions do not abate immediately.
   2. Excessive wind conditions which threaten the safety of workers or pose a hazard for materials or tools being blown away from the immediate work areas resulting in hazards to the building, property, building employees or general public. Due to the height of the work area above ground excessive wind conditions shall be considered events where sustained winds above 20 MPH or gusting winds above 25 MPH occur during the work hours.

3. Extreme heat hazards occur when outdoor dry bulb temperatures exceed 100-degrees Fahrenheit for more than 1-hour during the work period or when the combination of temperature result in a heat-index equal or exceed 105-degrees Fahrenheit for more than 1-hour.
4. Ozone Action Days when declared by the National Weather Service, ADEQ, or other authorized Government agency and when construction operations involve the use of volatile organic compounds (VOC), hydro-carbon based or petroleum based products which contribute to the development of ozone. Contractor should suspend operations which contribute to ozone creation until the Ozone alert has expired.
5. Extreme cold hazards occur when the outdoor dry-bulb falls below the minimum application temperature recommended by the material manufacturer for the proper handling and installation of the product. Installation of materials shall not resume until the application surface temperature raise above the manufacture's minimum recommendations.

C. The Contractor shall submit documentation from the National Weather Service or other sources acceptable to the Owner when requesting additional time for adverse weather delays.

3.08 REQUESTS FOR INFORMATION (RFI)

A. Definition: A request seeking one of the following:
1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
2. A resolution to an issue which has arisen due to field conditions and affects design intent.

B. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
1. Prepare a separate RFI for each specific item.
a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
b. Do not forward requests which solely require internal coordination between subcontractors.
2. Prepare using software provided by the Electronic Document Submittal Service.

C. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
a. Approval of submittals (use procedures specified elsewhere in this section).
b. Approval of substitutions (see Section - 01 60 00 - Product Requirements)
c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).

D. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
1. Official Project name and number, and any additional required identifiers established in Contract Documents.
2. Owner's, Architect's, and Contractor's names.
3. Discrete and consecutive RFI number, and descriptive subject/title.
4. Issue date, and requested reply date.
5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

E. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

F. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
   1. Indicate current status of every RFI. Update log promptly and on a regular basis.
   2. Note dates of when each request is made, and when a response is received.

3.09 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.

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

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

3.10 SUBMITTALS FOR INFORMATION

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

B. Submit for Architect's knowledge as contract administrator or for Owner.

3.11 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 78 00 - Closeout Submittals:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Other types as indicated.

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

3.12 NUMBER OF COPIES OF SUBMITTALS

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

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

3.13 SUBMITTAL PROCEDURES

A. General Requirements:
   1. Use a separate transmittal for each item.
   2. Use a single transmittal for related items.

3. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
    a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
4. Deliver each submittal.
    a. Deliver submittals to Architect at business address.
    b. Send submittals in electronic format via email to Architect.
5. Schedule submittals to expedite the Project, and coordinate submission of related items.
    a. For each submittal for review, allow 10 days excluding delivery time to and from the Contractor.
6. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
7. When revised for resubmission, identify all changes made since previous submission.
8. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
9. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.

B. Product Data Procedures:
1. Submit only information required by individual specification sections.
2. Collect required information into a single submittal.
3. Do not submit (Material) Safety Data Sheets for materials or products.

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

D. Samples Procedures:
1. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.

3.14 SUBMITTAL REVIEW

A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.

B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.

C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.

D. Architect's and consultants' actions on items submitted for review:
1. Authorizing purchasing, fabrication, delivery, and installation:
    a. "Approved", or language with same legal meaning.
    b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
        1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
    c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
        1) Resubmit corrected item, with review notations acknowledged and incorporated. Resubmit separately, or as part of project record documents.
2. Not Authorizing fabrication, delivery, and installation:
    a. "Revise and Resubmit".
        1) Resubmit revised item, with review notations acknowledged and incorporated.
    b. "Rejected".
        1) Submit item complying with requirements of Contract Documents.

E. Architect's and consultants' actions on items submitted for information:
   1. Items for which no action was taken:
      a. "Received" - to notify the Contractor that the submittal has been received for record only.
   2. Items for which action was taken:
      a. "Reviewed" - no further action is required from Contractor.

END OF SECTION 01 30 00

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Test Reports.

B. Manufacturer's Instructions

C. References and Standards.

D. Control of Installation.

1.02 TEST REPORTS

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

B. Test Reports: After each test/inspection, promptly submit one copy of report to Architect and to Contractor.
   1. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

C. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
   1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

1.03 MANUFACTURER'S INSTRUCTIONS

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

B. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
   1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

C. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
   1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

1.04 REFERENCES AND STANDARDS

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

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

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

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

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

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

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

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

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

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

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

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

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

H. Verify that existing conditions are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

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

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

3.02 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

END OF SECTION 01 40 00

SECTION 01 78 00
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project record documents.

B. Operation and maintenance data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

B. Individual Product Sections: Specific requirements for operation and maintenance data.

1.03 SUBMITTALS

A. Provide (2) closeout binders with the following information included as applicable to the project:
   1. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
   2. Operation and Maintenance Data:
      a. Final air balance reports
      b. Equipment product information
   3. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   4. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   5. Submit two sets of revised final documents in final form within 10 days after final inspection.
   6. Warranties and Bonds:
      a. Contractor's one year warranty letter
      b. Roof warranty
      c. Termite certificate
   7. Approvals:
      a. Fire Marshal approval
      b. State plumbing and HVAC inspection reports
   8. Release of Claims
   9. Consent of Surety
   10. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   11. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.
   5. Reviewed shop drawings, product data, and samples.
   6. Manufacturer's instruction for assembly, installation, and adjusting.

3.02 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.
   3. Include performance curves, with engineering data and tests.
   4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

D. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

3.05 DEMONSTRATION AND INSTRUCTION

A. Demonstrate operation and maintenance of products to Owner personnel prior to date of Final Inspection.
   1. Provide servicing and lubrication schedule, and list of lubricants required.
   2. Include manufacturer's printed operation and maintenance instructions.
   3. Include sequence of operation by controls manufacturer.
   4. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
   5. Additional Requirements: As specified in individual product specification sections.

3.06 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.

F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.

I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

END OF SECTION 01 78 00

SECTION 02 41 00
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Selective demolition of building elements for alteration purposes.

1.02 DEFINITIONS

A. Demolish: Dismantle, raze, destroy, or wreck any building or structure or any part thereof.

B. Remove: Detach or dismantle items from existing construction and dispose of them off site, unless items are indicated to be salvaged or reinstalled.

C. Remove and Salvage: Detach or dismantle items from existing construction in a manner to prevent damage. Clean, package, label and deliver salvaged items to Owner in ready-for-reuse condition.

D. Remove and Reinstall: Detach or dismantle items from existing construction in a manner to prevent damage. Clean and prepare for reuse and reinstall where indicated.

PART 3 EXECUTION

2.01 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   3. Provide, erect, and maintain temporary barriers and security devices.
   4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   5. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
   6. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
   7. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from Owner.

C. Protect existing structures and other elements to remain in place and not removed.
   1. Provide bracing and shoring.
   2. Prevent movement or settlement of adjacent structures.
   3. Stop work immediately if adjacent structures appear to be in danger.

2.02 EXISTING UTILITIES

A. Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

2.03 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
   1. Verify construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Separate areas in which demolition is being conducted from areas that remain occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 50 00 in locations indicated on drawings.

C. Maintain weatherproof exterior building enclosure, except for interruptions required for replacement or modifications; prevent water and humidity damage.

D. Remove existing work as indicated and required to accomplish new work.
   1. Remove items indicated on drawings.

E. Services including, but not limited to, HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications: Remove existing systems and equipment as indicated.
   1. Maintain existing active systems to remain in operation, and maintain access to equipment and operational components.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   3. Verify that abandoned services serve only abandoned facilities before removal.
   4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings. Remove back to source of supply where possible, otherwise cap stub and tag with identification.

F. Protect existing work to remain.
   1. Prevent movement of structure. Provide shoring and bracing as required.
   2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
   4. Patch to match new work.

2.04 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 02 41 00

SECTION 03 05 16
UNDERSLAB VAPOR BARRIER - VAPOR PRO

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheet vapor barrier under concrete slabs on grade.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Preparation of subgrade, granular fill, placement of concrete.

1.03 REFERENCE STANDARDS

A. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2018a.

B. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products.

PART 2 PRODUCTS

2.01 MATERIALS

A. Underslab Vapor Barrier:
   1. Water Vapor Permeance: Not more than 0.010 perms, maximum.
   2. Thickness: 15 mils.
   3. Basis of Design:
      a. Vapor Pro: 3328 Executive Blvd, Mesquite, TX 75149. 972.216.3331

B. Accessory Products: Vapor barrier manufacturer's recommended tape, adhesive, mastic, etc., for sealing seams and penetrations in vapor barrier.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surface over which vapor barrier is to be installed is complete and ready before proceeding with installation of vapor barrier.

3.02 INSTALLATION

A. Install vapor barrier in accordance with manufacturer's instructions and ASTM E1643.

B. Install vapor barrier under interior slabs on grade; lap sheet over footings and seal to foundation walls.

C. Lap joints minimum 6 inches.

D. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions.

E. No penetration of vapor barrier is allowed except for reinforcing steel and permanent utilities.

F. Repair damaged vapor retarder before covering with other materials.

END OF SECTION 03 05 16

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete formwork.

B. Concrete building frame members.

C. Concrete for composite floor construction.

D. Concrete reinforcement.

E. Joint devices associated with concrete work.

F. Concrete curing.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.

B. Section 31 31 16 - Termite Control: Field-applied termiticide and mildewcide for concrete surfaces.

C. Section 32 13 13 - Concrete Paving: Sidewalks, curbs and gutters.

1.03 REFERENCE STANDARDS

A. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).

B. ACI 301 - Specifications for Structural Concrete; 2016.

C. ACI 302.1R - Guide to Concrete Floor and Slab Construction; 2015.

D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).

E. ACI 305R - Guide to Hot Weather Concreting; 2010.

F. ACI 306R - Guide to Cold Weather Concreting; 2016.

G. ACI 308R - Guide to External Curing of Concrete; 2016.

H. ACI 318 - Building Code Requirements for Structural Concrete; 2019, with Errata (2021).

I. ACI 347R - Guide to Formwork for Concrete; 2014, with Errata (2017).

J. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2020.

K. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2018a.

L. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2018.

M. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2021.

N. ASTM C150/C150M - Standard Specification for Portland Cement; 2021.

O. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).

P. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2019.

Q. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2019.

R. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2017.

S. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2021.

T. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2017.

U. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete; 2019.

V. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2012.

1.04 SUBMITTALS

A. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
   1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.

B. Mix Design: Submit proposed concrete mix design.
   1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.

C. Test Reports: Submit report for each test or series of tests specified.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.

B. Follow recommendations of ACI 305R when concreting during hot weather.

C. Follow recommendations of ACI 306R when concreting during cold weather.

D. For slabs required to include moisture vapor reducing admixture (MVRA), do not proceed with placement unless manufacturer's representative is present for every day of placement.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Moisture Emission-Reducing Curing and Sealing Compound, Membrane-Forming: Provide warranty to cover cost of flooring delamination failures for 10 years.
   1. Include cost of repair or removal of failed flooring, remediation with a moisture vapor impermeable surface coating, and replacement of flooring with comparable flooring system.

PART 2 PRODUCTS

2.01 FORMWORK

A. Comply with requirements of Section 03 10 00.

B. Formwork Design and Construction: Comply with guidelines of ACI 347R to provide formwork that will produce concrete complying with tolerances of ACI 117.

C. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
   1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.
   2. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
   3. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches of concrete surface.

2.02 REINFORCEMENT MATERIALS

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
   1. Type: Deformed billet-steel bars. Reinforcing Bars: ASTM A615 (S1), deformed billet steel bars of grades as indicated on the structural drawings, free from loose rust, scale and other coatings that may reduce bond.

B. Steel Welded Wire Reinforcement (WWR): Galvanized, plain type, ASTM A1064/A1064M.
   1. WWR Style: 4 x 8-W6 x W10.

C. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.

2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
3. Provide stainless steel, galvanized, plastic, or plastic coated steel components for placement within 1-1/2 inches of weathering surfaces.

2.03 CONCRETE MATERIALS

A. Strength: Concrete minimum ultimate strength at 28 days as specified for Footings 3,000 psi, Slab 3,000 psi.
   1. Prepare design mixes for concrete, in accordance with ACI 301 and ACI 318, except as otherwise specified.
   2. Proportion design mixes by weight for class of concrete required, complying with ACI 211, except as otherwise specified.
   3. Slump Limits: As specified on structural drawings
   4. Provide test results from the concrete supplier for proposed design mix, to establish the following:
      a. Gross weight and yield per cu. yd of trial mixtures.
      b. Measured slump.
      c. Measured air content.
      d. Compressive strength developed at 7 days and 28 days, from not less than 3 test cylinders cast for each 7-day and 28-days test, and for each design mix.
   5. Submit written reports to Architect for design mix at least 15 calendar days prior to the start of work.

B. Cement: ASTM C150/C150M, Type I - Normal Portland type.
   1. Acquire cement for entire project from same source.
   2. Fine and Coarse Aggregates: ASTM C33/C33M.
      a. Fine Aggregate: Clean, sharp, natural or manufactured sand, free from loam, clay, lumps, or other deleterious substances.
      b. Coarse Aggregate: Clean, uncoated, processed, locally available aggregate, containing no clay, mud, loam or foreign matter; maximum size of 1-1/2".
      c. Acquire aggregates for entire project from same source.
   3. Fly Ash: ASTM C618, Class C or F.
   4. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.04 ADMIXTURES

A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

B. Air Entrainment Admixture: ASTM C260/C260M.
   1. Air Entrained Admixture: ASTM C260, 5%.

C. Other Admixtures: Do not use other admixtures unless accepted by Architect.

2.05 ACCESSORY MATERIALS

A. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
   1. Grout: Comply with ASTM C1107/C1107M.
   2. Flowable Products: as approve equal.
      a. Euclid Chemical Company; NS GROUT: www.euclidchemical.com/#sle.
      b. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; DURAGROUT: www.laticrete.com/our-products/concrete-construction-chemicals/#sle.
      c. W. R. Meadows, Inc; 588-10K: www.wrmeadows.com/#sle.

2.06 BONDING AND JOINTING PRODUCTS

A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.
   1. Products: or approved equal.
      a. Euclid Chemical Company; AKKRO-7T: www.euclidchemical.com/#sle.
      b. SpecChem, LLC; Strong Bond Acrylic Bonder: www.specchemllc.com/#sle.
      c. W. R. Meadows, Inc; ACRY-LOK-: www.wrmeadows.com/#sle.

B. Acetate Bonding Agent: Non-redispersable polyvinyl acetate.
   1. Products: or approved equal
      a. Sonneborn "sonocrete:.
      b. Euclid "Eucoweld".
      c. L & M "Everbond"
      d. Retro Platte 99

C. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.

2.07 CURING MATERIALS

A. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309.
   1. Product dissipates within 4 to 6 weeks.
   2. Products: or approved equal.
      a. Euclid Chemical Company; COLOR-CRETE CURE AND SEAL VOC: www.euclidchemical.com/#sle.
      b. Kaufman Products Inc; Thinfilm 420 Resin Base: www.kaufmanproducts.net/#sle.
      c. W. R. Meadows, Inc; 1100-Clear: www.wrmeadows.com/#sle.

B. Curing and Sealing Compound, Moisture Emission-Reducing, Membrane-Forming: Clear, liquid sealer for application to newly-placed concrete; capable of providing adequate bond for flooring adhesives, initially and over the long term; with sufficient moisture vapor impermeability to prevent deterioration of flooring adhesives due to moisture emission.
   1. Use this product to cure and seal all slabs to receive adhesively applied flooring or roofing.
   2. Comply with ASTM C309 and ASTM C1315 Type I Class A.
   3. VOC Content: Less than 100 g/L.

2.08 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.

B. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.

2.09 MIXING

A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.

B. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
   1. Use latex bonding agent only for non-load-bearing applications.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.

3.04 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Notify Architect not less than 24 hours prior to commencement of placement operations.

C. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

3.05 SLAB JOINTING

A. Locate joints as indicated on drawings.

B. Anchor joint fillers and devices to prevent movement during concrete placement.

C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.

3.06 CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.

B. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
   1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
   2. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.

3.07 CURING AND PROTECTION

A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

3.08 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.

D. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.

E. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 50 cubic yards or less of each class of concrete placed.
   1. Test cylinders as follows: One at 7 days, two at 28 days, and reserve the remaining for testing after a longer period as required by the Architect, if the 28 days tests do not meet the required strength. In accordance with ASTM C 173 Volumetric Method, or ASTM C 231 Pressure Method, make air content check for each set of test cylinders. It is the responsibility of the testing laboratory to provide the results to the Architect and Contractor within five (5) days of performing the tests.
   2. Additionally, test slump every 25 cu. yds., recording location for report.
   3. The taking of samples from small pours of 10 cubic yards or less may be omitted at the discretion of Architect.

F. Testing:
   1. Where strength of any group of 3 cylinders or if any individual cylinder falls below minimum compressive strength specified, the Architect shall have the right to require that test specimens be cut from the structure. Specimens shall be selected by Architect from location in structure represented by test specimen or specimens which failed.
   2. Specimens shall be secured, prepared, and tested in accordance with ASTM C 42, within a period of 60 days after placing concrete.
   3. Concrete shall be considered to meet the strength requirement of this specification if it meets the strength requirements of paragraph 5.6.4. of ACI 318.
   4. Should laboratory analysis indicate that the proper concrete mix has not been used by the Contractor, all such concrete poured using the improper mix shall be subject to rejection.

5. The cost of cutting specimens from the structure, patching the resulting holes, and making the laboratory analysis shall be borne by the Contractor.
6. The holes from which the cored samples are taken shall be packed solid with no slump concrete proportioned in accordance with the ACI 211 "Recommended Practice for Selecting Proportions of No-Slump Concrete". The patching concrete shall have the same design strength as the specified concrete.
7. If any of the specimens cut from the structure fail to meet the requirements outlined in paragraph 5.6.4 of ACI 318, the Architect shall have the right to require any and all defective concrete to be replaced, and all costs resulting therefrom shall be borne by the Contractor.

G. Contractor Sampling: In addition to the slump tests specified above, the contractor shall keep a cone (mold) and rod apparatus on the job site for random testing of batches. When concrete does not meet the specified slump requirements, and when directed by Architect, immediately perform a slump test in accordance with ASTM C 143. Concrete not meeting the slump requirements shall be removed from the job site.

H. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

I. lab Testing: Cooperate with manufacturer of specified moisture vapor reducing admixture (MVRA) to allow access for sampling and testing concrete for compliance with warranty requirements.

3.09 DEFECTIVE CONCRETE

A. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

3.10 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION 03 30 00

SECTION 05 40 00
COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formed steel stud exterior wall and interior wall framing.

B. Exterior wall sheathing.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood blocking and miscellaneous framing.

B. Section 06 10 00 - Rough Carpentry: Roof and wall sheathing.

C. Section 07 21 00 - Thermal Insulation: Insulation within framing members.

D. Section 07 25 00 - Weather Barriers: Water-resistive barrier over sheathing.

E. Section 07 92 00 - Joint Sealants.

F. Section 09 21 16 - Gypsum Board Assemblies: Lightweight, non-load bearing metal stud framing.

G. Section 09 21 16 - Gypsum Board Assemblies: Gypsum-based sheathing.

H. Section 09 51 00 - Acoustical Ceilings: Ceiling suspension system.

1.03 REFERENCE STANDARDS

A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2018).

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

D. ASTM C955 - Standard Specification for Cold-Formed Steel Structural Framing Members; 2018, with Editorial Revision.

E. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2020.

F. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

G. PS 1 - Structural Plywood; 2009 (Revised 2019).

1.04 ADMINISTRATIVE REQUIREMENTS

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's data on factory-made framing connectors, showing compliance with requirements.

C. Manufacturer's Installation Instructions: Indicate special procedures, conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Framing:
   1. CEMCO: www.cemcosteel.com/#sle.
   2. ClarkDietrich: www.clarkdietrich.com/#sle.
   3. Jaimes Industries: www.jaimesind.com/#sle.
   4. Or approved equal.

B. Framing Connectors and Accessories:
   1. Same manufacturer as metal framing.

2.02 FRAMING SYSTEM

A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.

B. Design Requirements: Provide completed framing system having the following characteristics:
   1. Design: Calculate structural characteristics of cold-formed steel framing members according to AISI S100.
   2. Structural Performance: Design, engineer, fabricate, and erect to withstand specified design loads for project conditions within required limits.
   3. Design Loads: In accordance with applicable codes.
      a. Roof Live Loads:
         1) Live load: 20 psf.
         2) Snow Load: 10 psf.
   4. Live load deflection meeting the following, unless otherwise indicated:
      a. Roofs: Maximum vertical deflection under live load of 1/240 of span.
      b. Exterior Walls: Maximum horizontal deflection under wind load of 1/180 of span.
      c. Design non-axial loadbearing framing to accommodate not less than 1/2 in vertical deflection.
   5. Able to tolerate movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
   6. Able to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

2.03 FRAMING MATERIALS

A. Studs and Track: ASTM C955; studs formed to channel, C- or Sigma-shaped with punched web; U-shaped track in matching nominal width and compatible height.

B. Jamb Studs: Engineered, C-shaped with wide flanges, designed to replace conventional double-stud framing at openings.

C. Header: Engineered one-member or two-member assembly, with wide flanges, designed to replace conventional box or nested header framing at openings.
   1. Jamb Mounting Clips: Manufacturer's standard.

D. Framing Connectors: Factory-made, formed steel sheet.
   1. Material: ASTM A653/A653M SS Grade 33 and 40 (minimum), with G90/Z275 hot dipped galvanized coating for base metal thickness less than 10 gauge, 0.1345 inch, and factory punched holes and slots.
   2. Structural Performance: Maintain load and movement capacity required by applicable code, when evaluated in accordance with AISI S100.
   3. Fixed Connections: Provide non-movement connections for tie-down to foundation, floor-to-floor tie-down, roof-to-wall tie-down, joist hangers, gusset plates, and stiffeners.

2.04 FASTENERS

A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized per ASTM A153/A153M.

B. Anchorage Devices: Powder actuated.

2.05 WALL SHEATHING

A. Plywood; PS 1, Grade C-D, Exposure I. See structural for locations of all plywood sheathing.

B. Gypsum Board Wall Sheathing: See Section 09 21 16.

2.06 ACCESSORIES

A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.

B. Water-Resistive Barrier: See Section 07 25 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Verify field measurements and adjust installation as required.

3.02 INSTALLATION OF STUDS

A. Install components in accordance with manufacturers' instructions and ASTM C1007 requirements.

B. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 24 inches on center. Coordinate installation of sealant with floor and ceiling tracks.

C. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs.

D. Install load-bearing studs full length in one piece. Splicing of studs is not permitted.

E. Install load-bearing studs, brace, and reinforce to develop full strength and achieve design requirements.

F. Install intermediate studs above and below openings to align with wall stud spacing.

3.03 INSTALLATION OF WALL SHEATHING

A. Install wall sheathing with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using self-tapping screws.
   1. Provide steel diagonal bracing at corners with foam insulation or gypsum board wall sheathing.
   2. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges, and ends.

END OF SECTION 05 40 00

SECTION 05 44 00
COLD-FORMED METAL TRUSSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Light gauge cold-formed steel roof trusses.

B. Anchorages, bracing, and bridging.

1.02 RELATED REQUIREMENTS

A. Section 05 40 00 - Cold-Formed Metal Framing: Light gauge structural metal studs, joists, and rafters.

B. Section 06 10 00 - Rough Carpentry: Roof sheathing.

1.03 REFERENCE STANDARDS

A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2018).

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

C. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.

D. CFSEI 5000 - Field Installation Guide for Cold-Formed Steel Roof Trusses; May 2000.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Span charts.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings:
   1. Include detailed roof truss layout.
   2. Show member type, location, spacing, size and gauge, methods of attachment, and erection details. Indicate supplemental bracing, strapping, splices, bridging, and accessories.
   3. Include truss design drawings, signed and sealed by a qualified professional engineer registered in the State in which the Project is located, verifying ability of each truss design to meet applicable code and design requirements.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Design trusses under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver trusses and other materials in manufacturer’s unopened bundles or containers, each marked with manufacturer’s name, brand, type, and grade. Exercise care to avoid damage during unloading, storing, and erection.

B. Store trusses on blocking, pallets, platforms, or other supports, off the ground and in an upright position, sufficiently braced to avoid damage from excessive bending. Gently slope stored trusses to avoid accumulation of water on interior of truss chord members.

C. Protect trusses and accessories from contact with earth, corrosion, deformation, mechanical damage, or other deterioration when stored at project site.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cold-Formed Steel Trusses:
   1. Aegis Metal Framing, a Division of MiTek Industries: www.aegismetalframing.com/#sle.
   2. Alpine TrusSteel, an ITW Company Inc: www.trussteel.com/#sle.
   3. Or approved equal.

2.02 TRUSS DESIGN REQUIREMENTS

A. Design: Calculate structural characteristics of cold-formed steel truss members according to AISI S100.

B. Structural Performance: Design, engineer, fabricate, and erect trusses to withstand specified design loads for project conditions within required limits.
   1. Design Loads: In accordance with applicable codes.
      a. Roof Loads:
         1) Dead Load: 20 psf.
         2) Live Load: 10 psf.
         3) Snow Ground Load: 10 psf.
   2. Deflections: Live load deflection meeting the following, unless otherwise indicated:
      a. Roofs: Maximum vertical deflection under live load of 1/240 of span.
   3. Design trusses to accommodate movement attributable to temperature changes within a range of 120 degrees F without damage or overstressing, sheathing failure, undue strain on fasteners and anchors, or other deleterious effects.

2.03 COMPONENTS

A. Trusses: Light gauge steel assemblies providing a complete horizontal framing system for locations indicated, ready for deck installation.
   1. Truss Type, Span, and Height: As indicated on drawings.
   2. Chord and Web Members: Fabricate required shapes from commercial quality galvanized steel sheet complying with ASTM A653/A653M, with minimum yield strength of 40,000 psi; minimum G60/Z180 coating; gauges as required for load conditions; all edges rolled or closed.

B. Fasteners: Self-drilling, self-tapping screw fasteners with corrosion-resistant plated finish, as recommended by steel truss manufacturer and marked for easy identification.
   1. Welding: Comply with applicable provisions of AWS D1.1/D1.1M and AWS D1.3/D1.3M.

C. Bracing, Bridging, and Blocking Members: Fabricate required shapes from commercial quality galvanized steel sheet complying with ASTM A653/A653M, with minimum yield strength of 33,000 psi; minimum G60/Z180 coating; gauges as required for load conditions.

2.04 FABRICATION

A. Factory fabricate cold-formed steel trusses plumb, square, true to line, and with secure connections, complying with manufacturer’s recommendations and project requirements.
   1. Fabricate trusses using jig templates.
   2. Cut truss members by sawing, shearing, or plasma cutting.
   3. Fasten members in full compliance with instructions of manufacturer. Wire tying of framing members is not permitted.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine structure, substrates, and installation conditions. Notify Architect of unsatisfactory preparation. Do not begin installation until substrates have been properly prepared and unsatisfactory conditions have been corrected.

B. Proceeding with installation indicates installer’s acceptance of substrate conditions.

3.02 INSTALLATION

A. Install cold-formed steel trusses in strict accordance with manufacturer's instructions and approved shop drawings, using approved fastening methods.

B. Install temporary erection bracing and permanent bracing and bridging before application of any loads. Erect trusses with plane of truss webs vertical and parallel to each other, accurately located at spacing indicated. Anchor trusses securely at bearing points.

C. Adequately distribute applied loads to avoid exceeding the carrying capacity of any one joint, truss, or other component.

D. Exercise care to avoid damaging truss members during lifting and erection and to minimize horizontal bending of trusses.

E. Removal, cutting, or alteration of any truss chord, web, or bracing member in the field is prohibited, unless approved in advance by Architect or the engineer of record and the truss manufacturer.

F. Repair or replace damaged members and complete trusses as directed and approved in writing by Architect or the engineer of record and the truss manufacturer.

G. Galvanizing Repair: Touch up bare steel with zinc-rich paint in compliance with ASTM A780/A780M.

H. Roof Trusses:
   1. Comply with recommendations of CFSEI 5000.
   2. Align truss bottom chords with load-bearing studs or continuously reinforce track as required to transfer loads to structure.
   3. Install continuous bridging and permanent truss bracing as indicated.
   4. Install roof cross bracing and diagonal bracing as indicated.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 40 00 - Quality Requirements.

3.04 PROTECTION

A. Protect trusses from damage by subsequent construction activities.

B. Repair or replace damaged trusses, truss members, and bracing members; obtain approval in advance by Architect or the engineer of record and the truss manufacturer for all cutting, repairs, and replacements.

END OF SECTION 05 44 00

SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel and aluminum items.

1.02 REFERENCE STANDARDS

A. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020.

1.03 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.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

2.02 MATERIALS - ALUMINUM

2.03 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. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.04 FABRICATED ITEMS

2.05 FINISHES - ALUMINUM

A. Exterior Aluminum Surfaces: Class I color anodized.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

3.03 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.

END OF SECTION 05 50 00

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural dimension lumber framing.

B. Sheathing.

C. Roofing nailers.

D. Preservative treated wood materials.

E. Miscellaneous framing and sheathing.

F. Concealed wood blocking, nailers, and supports.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Setting anchors in concrete.

B. Section 05 50 00 - Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.

C. Section 07 25 00 - Weather Barriers: Water-resistive barrier over sheathing.

D. Section 07 27 00 - Air Barriers: Air barrier over sheathing.

E. Section 09 21 16 - Gypsum Board Assemblies: Gypsum-based sheathing.

F. Section 31 31 16 - Termite Control: Field-applied termiticide and mildewcide for wood materials.

1.03 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

B. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.

C. AWPA U1 - Use Category System: User Specification for Treated Wood; 2018.

D. PS 20 - American Softwood Lumber Standard; 2020.

E. SPIB (GR) - Grading Rules; 2014.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide technical data on insulated sheathing, wood preservative materials, and application instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Correct defective work within a two-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.

1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).

B. Sizes: Nominal sizes as indicated on drawings, stright and true.

C. Moisture Content: S-dry or MC19.

D. Stud Framing (2 by 2 through 2 by 6):
   1. Species: Southern Pine.
   2. Grade: No. 2.

E. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16):
   1. Species: Southern Pine.
   2. Species and Grades: As indicated on drawings for various locations.

F. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.

2.03 CONSTRUCTION PANELS

A. Roof Sheathing: Oriented strand board wood structural panel; PS 2.
   1. Grade: Structural 1 Sheathing.
   2. Bond Classification: Exposure 1.
   3. Performance Category: 5/8 PERF CAT.
   4. Edges: Square.
   5. Exposure Time: Sheathing will not delaminate or require sanding due to moisture absorption from exposure to weather for up to 500 days.
   6. Provide fastening guide on top panel surface with separate markings indicating fastener spacing for 16 inches and 24 inches on center, respectively.
   7. Warranty: Manufacturer's standard lifetime limited warranty against manufacturing defects and that panels will not delaminate or require sanding due to moisture absorption damage from exposure to weather for up to the stated period.

B. Wall Sheathing: Oriented strand board wood structural panel; PS 2.
   1. Grade: Structural 1 Sheathing.
   2. Bond Classification: Exposure 1.
   3. Performance Category: 5/8 PERF CAT.
   4. Span Rating: 40/20.
   5. Exposure Time: Sheathing will not delaminate or require sanding due to moisture absorption from exposure to weather for up to 500 days.
   6. Provide fastening guide on top panel surface with separate markings indicating fastener spacing for 16 inches and 24 inches on center, respectively.
   7. Warranty: Manufacturer's standard lifetime limited warranty against manufacturing defects and that panels will not delaminate or require sanding due to moisture absorption damage from exposure to weather for up to the stated period.

2.04 ACCESSORIES

A. Fasteners and Anchors:
   1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
   2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.

B. Air Barrier: See Section 07 27 00.

2.05 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

PART 3 EXECUTION

3.01 PREPARATION

A. Where wood framing bears on cementitious foundations, install full width sill flashing continuous over top of foundation, lap ends of flashing minimum of 4 inches and seal.

3.02 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 FRAMING INSTALLATION

A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.

B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.

C. Install structural members full length without splices unless otherwise specifically detailed.

D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AWC (WFCM) Wood Frame Construction Manual.

E. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.

F. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.04 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to authorities having jurisdiction may be used in lieu of solid wood blocking.

C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

F. Provide the following specific nonstructural framing and blocking:
   1. Cabinets and shelf supports.
   2. Wall brackets.
   3. Handrails.
   4. Grab bars.
   5. Towel and bath accessories.
   6. Wall-mounted door stops.
   7. Chalkboards and marker boards.
   8. Wall paneling and trim.
   9. Joints of rigid wall coverings that occur between studs.

3.05 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

3.06 INSTALLATION OF CONSTRUCTION PANELS

A. Subflooring/Underlayment Combination: Glue and nail to framing; staples are not permitted.

3.07 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

END OF SECTION 06 10 00

SECTION 06 16 43
GYPSUM SHEATHING

1 GENERAL

1.01 SUMMARY

A. Section Includes: Fiberglass-mat faced, moisture and mold resistant gypsum sheathing.

B. Related Sections:
   1. Section 05 41 00 Structural Metal Stud Framing.
   2. Section 06 10 00 Rough Carpentry.
   3. Section 09 21 16 Gypsum Board Assemblies.

1.02 REFERENCES

A. ASTM International (ASTM):
   1. ASTM C473 Standard Test Methods for Physical Testing of Gypsum Panel
      a. Products.
   2. ASTM C518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
   3. ASTM C1002 Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
   4. ASTM C1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
   5. ASTM C1280 Standard Specification for Application of Gypsum Sheathing.
   6. ASTM D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
   7. ASTM D6329 Standard Guide for Developing Methodology for Evaluating the Ability of Indoor Materials to Support Microbial Growth Using Static Environmental Chambers.
   8. ASTM E72 Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
   9. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.
      a. ASTM C1396 Standard Specification for Gypsum Board
         1) ASTM E 136 Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C
         2) ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials

B. Gypsum Association (GA): GA-253 Application of Gypsum Sheathing.

1.03 SUBMITTALS

A. Product Data: Manufacturer’s specifications and installation instructions for each product specified.

1.04 WARRANTY

A. Provide products that offer twelve months of coverage against in-place exposure damage (delamination, deterioration and decay) commencing with the date of installation of the product in such structure.

B. Manufacturer’s Warranty:

C. Five years against manufacturing defects from the date of purchase of the product for installation

2 PRODUCTS

2.01 IF PROPRIETARY PRODUCT NAMES ARE INCLUDED IN THE “

2.02 MANUFACTURERS

A. Georgia-Pacific Gypsum LLC:
   1. Fiberglass-Mat Faced Gypsum Sheathing: DensGlass Sheathing.

2.03 MATERIALS

A. Fiberglass-Mat Faced Gypsum Sheathing: ASTM C1177,:
   1. Thickness: 5/8 inch.
   2. Width: 4 feet.
   3. Length: [8 feet] [9 feet] [10 feet].

4. Weight: 2.5 lb/sq. ft.
5. Edges: Square.
6. Surfacing: Fiberglass mat on face, back, and long edges.
7. Racking Strength (Ultimate, not design value) (ASTM E72): Not less than 654 pounds per square foot, dry.
8. Flexural Strength, Parallel (ASTM C1177): 100 lbf, parallel.
9. Humidified Deflection (ASTM C1177): Not more than 1/8 inch.
10. Permeance (ASTM E96): Not less than 17 perms.
11. 11. R-Value (ASTM C518): 0.67.
12. Mold Resistance (ASTM D3273): 10, in a test as manufactured.
13. Microbial Resistance (ASTM D6329, UL Environmental GREENGUARD 3-week protocol): Will not support microbial growth.
14. Acceptable Products:
    a. 5/8 inch DensGlass Fireguard Sheathing, Georgia-Pacific Gypsum LLC. b.

2.04 ACCESSORIES

A. Screws: ASTM C1002, corrosion resistant treated.

3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:
   1. Inspection: Verify that project conditions and substrates are acceptable, to the installer, to begin installation of work of this section.

3.02 INSTALLATION

A. General: In accordance with GA-253, ASTM C1280 and the manufacturer's recommendations.
   1. Manufacturer's Recommendations:
      a. Current "Product Catalog", Georgia-Pacific Gypsum. b.

3.03 PROTECTION

A. Protect gypsum board installations from damage and deterioration until date of Substantial Completion.

END OF SECTION 06 16 43

SECTION 07 21 00
THERMAL INSULATION

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

B. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.

C. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

D. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of contractor accreditation and installer certification on project site during and after installation. Present on-site documentation upon request.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation Under Concrete Slabs: Extruded polystyrene (XPS) board.

2.02 SECTION INCLUDES

A. Board insulation at perimeter foundation wall and underside of floor slabs.

B. Batt insulation and vapor retarder in exterior wall, ceiling, and roof construction.

C. Insulation in Wood Framed Walls: Batt insulation with separate air barrier.

2.03 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Installation requirements for board insulation over steep slope roof sheathing or roof structure.

2.04 FOAM BOARD INSULATION MATERIALS

A. Section 07 27 00 - Air Barriers: Separate air barrier materials.

2.05 REFERENCE STANDARDS

A. Termite-Resistant Expanded Polystyrene (EPS) Board Insulation: Comply with ASTM C578.
   1. Termite Resistance: Comply with ICC-ES AC239.
   2. Flame Spread Index (FSI): 25 or less, when tested in accordance with ASTM E84.
   3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   4. Board Thickness: 1-1/2 inch.

B. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2019.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021a.

D. ICC-ES AC239 - Acceptance Criteria for Termite-Resistant Foam Plastic; 2008, with Editorial Revision (2014).

E. See Section 01 30 00 - Administrative Requirements for submittal procedures.

2.06 QUALITY ASSURANCE

A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/#sle:
   1. Installer Qualification: Use accredited contractors, certified installers, evaluated materials, and third-party field quality control audit.
   2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.

2.07 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 3 EXECUTION

3.01 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Adhere a 6 inches wide strip of polyethylene sheet over construction, control, and expansion joints with double beads of adhesive each side of joint.

3.02 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.

3.03

A. Install boards horizontally on foundation perimeter.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. At wood framing, place vapor retarder on warm side of insulation by stapling at 6 inches on center. Lap and seal sheet retarder joints over face of member.

F. Tape seal tears or cuts in vapor retarder.

G. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane; tape seal in place.

H. Coordinate work of this section with construction of air barrier seal, see Section 07 27 00.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Coordination of Air Barrier Association of America (ABAA) Tests and Inspections:
   1. Provide testing and inspection required by ABAA Quality Assurance Program (QAP).
   2. Notify ABAA in writing of schedule for air barrier work, and allow adequate time for testing and inspection.
   3. Cooperate with ABAA testing agency.
   4. Allow access to air barrier work areas and staging.
   5. Do not cover air barrier work until tested, inspected, and accepted.

3.05 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

SECTION 07 25 00
WEATHER BARRIERS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Commercial weather barrier assemblies.
   2. Flexible flashing.
   3. Weather barrier accessories.

B. Related Requirements:
   1. Section 042000 "Unit Masonry" for masonry ties and flashing installation.

1.03 DEFINITIONS

A. Weather Barrier: A combination of materials and accessories that do the following:
   1. Prevent the accumulation of water as a water-resistive barrier.
   2. Minimize the air leakage into or out of the building envelope as a continuous air barrier.
   3. Provide sufficient water vapor transmission to enable drying as a vapor-permeable membrane.

B. Water-Resistive Barrier: A combination of materials and accessories that prevent the accumulation of water within the wall assembly per International Building Code Section 1403.2.

C. Continuous Air Barrier: The combination of interconnected materials, assemblies, and sealed joints and components of the building envelope that minimize air leakage into or out of the building envelope per ASHRAE 90.1 section 5.4.3.1.

D. Vapor Diffusion: A slow movement of individual water vapor molecules from regions of higher to lower water vapor concentration (higher to lower vapor pressure).

E. Vapor Permeable Membrane: The property of having a water-vapor permeance rating of 10 perms (575 ng/Pa x s x sq. m) or greater, when tested in accordance with the desiccant method using Procedure A of ASTM E96 per definition in International Building Code. Vapor permeable material permits the passage of moisture vapor through vapor diffusion.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. For weather barrier, include data on air and water-vapor permeance based on testing in accordance with referenced standards.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is certified by weather barrier system manufacturer to install manufacturer's product.

B. Laboratory Mockup Testing Agency Qualifications: Qualified in accordance with ASTM E699 for testing indicated[and accredited by IAS or ILAC Mutual Recognition Arrangement in compliance with ISO/IEC 17025].

1.06 DELIVERY, STORAGE, AND HANDLING

A. Do not store near heat source or open flame.

1.07 WARRANTY

A. Manufacturer's Product and Labor Warranty: Manufacturer agrees to repair or replace weather barrier that fails in materials within specified warranty period, including removal and replacement of affected construction up to manufacturer's limits.
   1. Warranty Period: 10 years from date of purchase.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations: Obtain weather barrier assembly components, including [weather barrier flashing] [and] [foam insulation] from [same manufacturer as weather barrier] [or] [manufacturer approved by weather barrier manufacturer].

2.02 PERFORMANCE REQUIREMENTS

A. General Performance: Installed weather barrier and accessories shall withstand specified wind pressures, liquid water penetration, and water vapor pressures without failure due to defective manufacture of products.

2.03 WEATHER BARRIER

A. Commercial Building Wrap: ASTM E2357 passed, ABAA (Air Barrier Association of America) evaluated air barrier assembly, and assembly water resistance per ASTM E331; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested in accordance with ASTM E84; UV stabilized for nine-month exposure; and acceptable to authorities having jurisdiction.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont de Nemours, Inc.; Tyvek CommercialWrapor comparable product by one of the following:
      a. .
   2. System Description, Single-Layer Weather Barrier: Single-layer weather barrier, including flashing and sealing of penetrations and seams.
   3. System Description, Single-Layer Drainable: Single-layer weather barrier with integral drainage, including flashing and sealing of penetrations and seams.
   4. System Description, Double-Layer Drainable: Double-layer weather barrier, including flashing and sealing of penetrations and seams, arranged as follows:
      a. Primary Layer: Commercial building wrap [with] [without] integral drainage installed closest to building interior.
      b. Secondary Layer: Commercial building wrap [with] [without] integral drainage installed over primary layer.
   5. Drainability: 98 percent or greater when tested in accordance with ASTM E2273.
   6. Air Permeance, Product: Not more than [0.001 cfm/sq. ft. at 1.57 lbf/sq. ft. (0.005 L/s x sq. m at 75 Pa)] [0.004 cfm/sq. ft. at 1.57 lbf/sq. ft. (0.02 L/s x sq. m at 75 Pa)] when tested in accordance with ASTM E2178.
   7. Air Permeance, Assembly: Not more than 0.04 cfm/sq. ft. at 1.57 lbf/sq. ft. (0.2 L/s x sq. m at 75 PA) when tested in accordance with ASTM E 2357 and evaluated by ABAA.
   8. Water Penetration Resistance, Product: Hydrostatic head resistance greater than 7.7 ft. (2.35 m) in accordance with AATTC 127.
   9. Water Penetration Resistance, Assembly: Assembly wall specimen described in ASTM E2357 to water resistance in accordance with ASTM E331 to [2.86 lbf/sq. ft. (137 Pa)] [6.24 lbf/sq. ft. (300 Pa)] [10.4 lbf/sq. ft. (500 Pa)] [12.5 lbf/sq. ft. (575 Pa)] [15 lbf/sq. ft. (718 Pa)].
   10. Water-Vapor Permeance: Not less than 23 perms (1300 ng/Pa x s x sq. m) per ASTM E96/E96M, Desiccant Method (Procedure A) or not less than 28 perms (1600 ng/Pa x s x sq. m) per ASTM E96/E96M, Water Method (Procedure B).
   11. Water-Vapor Permeance: Not less than 30 perms (1700 ng/Pa x s x sq. m) per ASTM E96/E96M, Desiccant Method (Procedure A) or not less than 46 perms (2600 ng/Pa x s x sq. m) per ASTM E96/E96M, Water Method (Procedure B).
   12. Allowable UV Exposure Time: Not less than nine months when tested in accordance with ASTM G155 (Accelerated Weathering).
   13. Flame Propagation Test: Materials and construction shall be as tested in accordance with NFPA 285.
   14. Heat and Visible Smoke Release Rates: Maximum rates in accordance with NFPA 285.
      a. Peak Heat Release: 13,217 Btu/sq. ft. (150 kW/sq. m).
      b. Total Heat Release: 1762 Btu/sq. ft. (20 MJ/sq. m).
      c. Effective Heat of Combustion: 7744 Btu/lb (18 MJ/kg).
   15. Weather barrier system to have a VOC content of 30 g/L or less.

2.04 WEATHER BARRIER FLASHING

A. Strip Flashing: Composite flashing material composed of spunbonded polyethylene laminate with 100 percent butyl-based, dual-sided, adhesive layer; AAMA 711, Class A (no primer), Level 3 thermal exposure, 176 deg F (80 deg C) for seven days.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont de Nemours, Inc.; [StraightFlash] [StraightFlash VF] or comparable product by one of the following:
      a. .
   2. Water Penetration: No leakage at 15 psf (720 Pa) per ASTM E331.
   3. Low Temperature Adhesion: Exceeds minimum value of 1.5 lb./in. (0.26N/mm) at 25 deg F (minus 4 deg C) as Class A without primer use.
   4. Adhesion After Water Immersion: Exceeds minimum value of 1.5 lb./in. (0.26N/mm), after AAMA 800, Sections 2.4.1.3.1/2.4.1.4.3, Test B.

2.05 WEATHER BARRIER ACCESSORIES

A. Building-Wrap Tape: as recommended by weather barrier manufacturer for sealing joints and penetrations in commercial building wrap.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont de Nemours, Inc.; DuPont™ Flashing Tape or comparable product.

B. Fasteners
   1. Basis-of-Design Product: Subject to compliance with requirements, Provide Rodenhouse Thermal-Grip Flat Washer Fastener as required by Manufacturer’s system warranty.

C. Primer for Flashings: Synthetic rubber-based product; spray applied. Strengthen adhesive bond at low temperature applications between weather products such as self-adhered flashing products, commercial building wraps, and common building sheathing materials.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont de Nemours, Inc.; DuPont Adhesive Primer or comparable product.
   2. Peel Adhesion Test: Passes in accordance with ASTM D3330, Test Method F, for the following.
      a. Peel Angles: 0, 25, 72, and 180 degrees.
      b. Substrates: Concrete masonry units (CMUs), exterior gypsum sheathing, oriented strand board (OSB), aluminum, and vinyl.
   3. Chemical Compatibility: Pass; AAMA 713.
   4. Flame Spread Index: 5; ASTM E84.
   5. Smoke Development Index: 0; ASTM E84.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements.

B. Verify that substrate and surface conditions are in accordance with commercial weather barrier manufacturer recommendations prior to installation.
   1. Verify that rough sill framing for doors and windows is sloped downwards towards the exterior and is level across width of the opening.

C. Verify that surfaces to receive weather barrier flashing are clean, dry, and free of frost.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Direct water onto an acceptable weather barrier drainage plane with an unobstructed path to exterior of wall.
   1. Provide a drainage path for water intrusion through window and door attachment system that collects at window and door sills and directs water to the exterior or weather barrier.

3.03 COMMERCIAL BUILDING WRAP INSTALLATION

A. General: Comply with weather barrier manufacturer's written installation guidelines and warranty requirements.

B. Cover exposed exterior surface of sheathing with weather barrier securely fastened to framing immediately after sheathing is installed.

1. Maintain continuity of air and water barrier assemblies.
2. Start weather barrier installation at a building corner, leaving 12 inches (300 mm) of weather barrier extended beyond corner to overlap.
3. Install weather barrier horizontally starting at lower portion of wall surface.
4. Provide minimum 6 inches (150 mm) overlap at horizontal- and vertical-wrap seams in a shingle manner to maintain continuous downward drainage plane and air and water barrier.

C. Seams: Seal seams with building wrap tape per manufacturer's recommended installation instructions.
1. Shiplap horizontal seams in weather barrier to facilitate proper drainage.

D. Fasteners: Use weather barrier manufacturer's recommended fasteners to secure weather barrier and install fasteners according to weather barrier manufacturer's installation guidelines.
1. Do not use temporary fasteners to permanently attach weather barrier.
2. Do not place fasteners with gasketing washers where weather barrier flashing will be installed.
3. Install fasteners with gasketing washers through flashing where recommended by manufacturer.

E. Openings: Completely cover openings with weather barrier, then cut weather barrier membrane to openings in accordance with weather barrier manufacturer's installation guidelines.
1. Provide head and jamb flaps and seam overlaps to maintain continuous drainage.
2. Repair damage to weather barrier using method recommended by weather barrier manufacturer.
3. Install flashing in accordance with weather barrier manufacturer's installation guidelines.

3.04 WEATHER BARRIER FLASHING INSTALLATION

A. Installation: Remove wrinkles and bubbles, reposition weather barrier as necessary to produce a uniform, smooth surface.
1. Ensure that ambient and substrate surface temperatures are acceptable in accordance with manufacturer instructions and recommendations.
2. Wipe surfaces to remove moisture, dirt, grease and other debris that could interfere with adhesion.
3. Apply weather barrier manufacturer's recommended primer over concrete, masonry, and glass-mat gypsum wall sheathing substrates to receive weather barrier flashing.
4. Lap weather barrier flashing a minimum of 2 inches (50 mm) onto weather barrier.
5. Apply pressure over entire surface using roller or firm hand pressure

B. Rough Openings: Shiplap flashing with weather barrier in a shingle manner to maintain a continuous downward drainage plane and air and water barrier in accordance with manufacturer's written instructions.
1. Apply [6-inch- (150-mm-)] [9-inch- (230-mm-)] wide conformable weather barrier flashing at door and window sills.
2. Ensure that sill flashing does not slope to the interior.
3. Install backer rod in joint between frame of opening product and flashed rough opening on the interior.
4. Apply sealant or closed-cell polyurethane foam insulation around entire opening/fenestration product to create air seal around interior perimeter of window openings in accordance with weather barrier manufacturer's instructions.
5. Around door and window openings, apply butyl-based flashing to flaps of weather barrier.
6. Use strip flashing with wrap cap screws to secure head flap of the windows.

C. Penetrations: Apply weather barrier manufacturer's recommended weather barrier flashing patches behind fastening plates, such as brick-tie base plates, metal-flashing clips, and metal channels.
1. Seal weather barrier around each penetration with weather barrier manufacturer's recommended self-adhered flashing product or sealant. Integrate products with flanges into the weather barrier.

D. Terminations: Provide minimum 2 inches (50 mm) overlap using strip flashing on adjoining roof and base of wall systems to maintain continuous downward drainage plane.
1. Secure weather barrier with fasteners and weather barrier flashing.

3.05 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to train installers and observe subject test-wall areas and installations.

B. Testing Agency: [Owner will engage] [Engage] a qualified third-party testing agency to perform tests and inspections.

C. Test Area: Perform tests on [one bay at least 30 ft. (9.15 m), by one story] [representative areas of structural-sealant-glazed curtain walls] [mockups] .

D. Field Quality Control Testing: Perform the following test on [representative areas of structural-sealant-glazed curtain walls] [mockups] .
   1. Air Infiltration Whole Building: ASTM E779 at not more than [0.40 cfm/sf (2.00 L/s per sq. m)] [0.25 cfm/sf (1.25 L/s per sq. m)] [0.15 cfm/sf (0.75 L/s per sq. m)] at 1.57 lb/sq. ft. (75 Pa).
   2. Water Penetration: ASTM E1105 at a minimum [uniform] [and] [cyclic] static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than [2.86 lbf/sq. ft. (137 Pa)] [6.24 lbf/sq. ft. (300 Pa)] [10.0 lbf/sq. ft. (500 Pa)] [12.5 lbf/sq. ft. (600 Pa)]. No water penetration shall occur as defined in ASTM E1105.
      a. Perform a minimum of [two] [three] tests in areas as directed by Architect.
      b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to [10, 30, and 70 percent completion] .

E. Test and Inspection Reports: Prepare test and inspection reports.

3.06 CLEANING

A. Immediately remove release paper and scrap from work area and dispose of material.

3.07 PROTECTION

A. Protect installed weather barrier from the following:
   1. Damage from cladding, structure, or a component of the structure (for example, window, door, or wall system).
   2. Contamination from building site chemicals, premature deterioration of building materials, or nonstandard use or application of products.
   3. Foreign objects or agents, including the use of materials incompatible with weather barrier products.
   4. UV exposure in excess of products' stated limits.

END OF SECTION 07 25 00

SECTION 07 42 13
METAL WALL PANELS - PETERSEN ALUMINUM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior wall panels.

B. Related flashings.

1.02 RELATED REQUIREMENTS

A. Section 05 40 00 - Cold-Formed Metal Framing: Wall panel substrate.

B. Section 06 10 00 - Rough Carpentry: Wall panel substrate.

C. Section 07 21 00 - Thermal Insulation.

D. Section 07 25 00 - Weather Barriers: Weather barrier under wall panels.

E. Section 07 62 00 - Sheet Metal Flashing and Trim: Transitions between wall panel substrate and wall panels.

F. Section 07 92 00 - Joint Sealants: Sealing joints between metal wall panel system and adjacent construction.

G. Section 09 21 16 - Gypsum Board Assemblies: Wall panel substrate.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data - Wall System: Manufacturer's data sheets on each product used, including:
   1. Physical characteristics of components shown on shop drawings.
   2. Storage and handling requirements and recommendations.
   3. Installation instructions and recommendations.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

B. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.

C. Prevent contact with materials that may cause discoloration or staining of products.

1.06 FIELD CONDITIONS

A. Do not install wall panels when air temperature or relative humidity is outside manufacturer's limits.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Metal Wall Panels - Exposed Fasteners:
   1. Petersen Aluminum Corporation; R-Panel: www.pac-clad.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 METAL WALL PANEL SYSTEM

A. Wall Panel System: Factory-fabricated, prefinished metal panel system, site assembled.
   1. Provide exterior wall panels and soffit panels.
   2. Provide components which will support panel dead loads and withstand live loads caused by positive and negative wind pressure acting normally to plane of wall.
   3. Movement: Accommodate movement within system without damage to components or deterioration of seals; between system and perimeter components when subject to seasonal temperature cycling; when subject to dynamic loading and release of loads; and under deflection of structural support framing.

4. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
5. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.

B. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.

C. Expansion Joints: Same material, thickness, and finish as exterior sheets; ___ gauge, ___ inch thick; manufacturer's standard brake-formed type, of profile to suit system.

D. Trim: Same material, thickness, and finish as exterior sheets; brake-formed to required profiles.

E. Anchors: Galvanized steel.

2.03 ACCESSORIES

A. Flashing: See Section 07 25 00.

B. Concealed Sealant: Noncuring butyl or tape sealant; see Section 07 9200.

C. Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers, steel, hot-dip galvanized. Fastener cap same color as exterior panel.

D. Field Touch-Up Paint: As recommended by panel manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building framing members are ready to receive panels.

B. Verify weather barrier, see Section 07 25 00, has been installed over wall panel substrate; see Section 05 40 00.

3.02 INSTALLATION

A. Install panels on walls and soffits in accordance with manufacturer's instructions.

3.03 CLEANING

A. Remove site cuttings from finish surfaces.

B. Remove protective material from wall panel surfaces.

3.04 PROTECTION

A. Protect metal wall panels until completion of project.

B. Touch up, repair, or replace damaged wall panels or accessories before Date of Substantial Completion.

END OF SECTION 07 42 13

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings and counterflashings.

B. Sealants for joints within sheet metal fabrications.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

D. CDA A4050 - Copper in Architecture - Handbook; current edition.

E. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sheet Metal Flashing and Trim Manufacturers:
   1. Petersen Aluminum Corporation; _____: www.pac-clad.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SHEET MATERIALS

A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 22-gauge, .0299-inch thick base metal, shop pre-coated with PVDF coating.
   1. Polyvinylidene Fluoride (PVDF) Coating: Superior performing organic powder coating, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.

2.03 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18-inch long legs; seam for rigidity, seal with sealant.

F. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.04 EXTERIOR PENETRATION FLASHING PANELS

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.

2.05 ACCESSORIES

A. Fasteners: Galvanized steel, with soft neoprene washers.

B. Primer: Zinc chromate type.

C. Concealed Sealants: Non-curing butyl sealant.

D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.

3.03 INSTALLATION

A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..

B. Apply plastic cement compound between metal flashings and felt flashings.

C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

D. Secure gutters and downspouts in place with concealed fasteners.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for field inspection requirements.

B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION 07 62 00

SECTION 07 90 00
JOINT SEALANTS

PART 1 - GENERAL

1.01 SCOPE:

A. Completely close all joints throughout the project, especially between dissimilar materials with sealant and backer rod or caulking compound. Including, but not limited to, are joints around frames of doors, windows and other openings in exterior walls, flooring joints, joints at wall intersections, change in direction of surfaces, intersections of surfaces, joints at penetration of walls, decks, and floors, by piping and other materials, and other services and equipment, joints between items of equipment and other construction, and other joints indicated or specified to be caulked or sealed.

1.02 SUBMITTALS: COMPLY WITH SECTION 01300.

1.03 PRODUCT DATA: SUBMIT MANUFACTURER'S SPECIFICATIONS, RECOMMENDATIONS, AND INSTALLATION INSTRUCTIONS FOR EACH TYPE OF SEALANT AND MISCELLANEOUS MATERIALS. INCLUDE LETTER OF CERTIFICATION OR CERTIFIED TEST LABORATORY REPORTS INDICATING THAT EACH MATERIAL COMPLIES WITH THE REQUIREMENTS AND IS INTENDED FOR THE APPLICATIONS INDICATED.

A. Samples: Submit 12" long sample of each color required (except black) for each type of sealant exposed to view. Samples will be viewed for color only.

1.04 JOB CONDITIONS:

A. Examine joint surfaces, backing, and anchorage of units forming sealant rabbet. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Do not proceed with installations of sealants under adverse weather conditions, or when temperatures are above or below manufacturer's recommended limitations for installation. Proceed with the work only when forecasted weather conditions are favorable for proper cure and development of high early bond strength.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Compatibility: Provide joint sealers, 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 testing and field experience.

B. Provide in colors as selected by Architect from manufacturer's standard colors.

2.02 ELASTOMERIC JOINT SEALANTS: PROVIDE MANUFACTURER'S STANDARD CHEMICALLY CURING, ELASTOMERIC SEALANT OF BASE POLYMER INDICATED WHICH COMPLIES WITH ASTM C920 REQUIREMENTS, INCLUDING THOSE FOR TYPE, GRADE CLASS, AND USES.

A. Two-Or-More Component Non-sag Urethane Sealant: Type M, Grade NS, Class 25. Tremco "Dymeric", Sonneborn "NP-2", Pecora "Dynatrol II" or Mameco "Vulkem 227".

B. One-Component Non-sag Urethane Sealant: Type M,, Grade NS, Class 25. Sonneborn "Sonolastic NP-1", Tremco "Dymonic", Pecora "Dynatrol I", or Mameco "Vulkem 116".

C. One-Component Pourable Urethane Sealant: Type S, Grade P, Class 25. Sonneborn "Sonolastic Paving Joint Sealant", Pecora "NR-201 Urexpan", or Mameco "Vulkem 45".

D. One-Component Mildew-Resistant Silicone Sealant: Type S, Grade NS, Class 25. GE "SCS 1702", Dow Corning "786", or Tremco "Proglaze White", or Pecora "863 #345 White".

2.03 ACRYLIC EMULSION SEALANT: ONE COMPONENT, NON-SAG, ACRYLIC, PAINTABLE, MILDEW-RESISTANT, COMPLYING WITH ASTM C834. TREMCO "ACRYLIC LATEX CAULK", SONNEBORN "SONOLAC", OR PECORA "AC-20".

2.04 MISCELLANEOUS MATERIALS:

A. Joint Cleaner: Type of joint cleaning compound recommended by the sealant or caulking compound manufacturer for the joint surfaces to be cleaned.

B. Joint Primer/Sealer: Type recommended by the sealant manufacturer for the joint surfaces to be primed or sealed.

C. Bond Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer, to be applied to sealant-contact surfaces where bond to the substrate or joint filler must be avoided for proper performance of sealant. Provide self-adhesive tape wherever applicable.

D. Sealant Backer Rod: Compressible rod stock open cell polyurethane foam. Provide size and shape of rod which will control the joint depth for sealant placement, break bond of sealant at bottom of joint, form optimum shape of sealant bead on back side, and provide a highly compressible backer to minimize the possibility of sealant extrusion when joint is compressed.

PART 3 - EXECUTION

3.01 JOINT TYPES AND USAGES: CAULKING AND SEALANT USAGE IS SPECIFIED BELOW.

A. Caulking: All interior joints except joints with metal, aluminum, and wet work.

B. Sealants: Use multi-component or one-component non-sag polyurethane at all exterior joints and interior joints with aluminum or metal. Use mildew resistant silicone sealant at sinks and plumbing fixtures. Use minimum 35 Shore A hardness urethane sealant for horizontal joints subject to pedestrian and vehicular traffic.

3.02 JOINT SURFACE PREPARATION:

A. Clean joint surfaces immediately before installation of sealant. Remove dirt, insecure coatings, moisture, and other substances which would interfere with bond of sealant.

B. For elastomeric sealants, do not proceed with installation of sealant over joint surfaces which have been painted, lacquered, waterproofed or treated with water repellent or other treatment or coating. Remove coating or treatment from joint surfaces before installing sealant.

C. Etch cementitious joint surfaces to remove excess alkalinity. Etch with 5% solution of muriatic acid; neutralize with dilute ammonia solution, rinse thoroughly with water and allow to dry before sealant installation.

D. Roughen joint surfaces on non-porous materials, wherever sealant manufacturer's data indicates lower bond strength than for porous surfaces. Rub with fine abrasive cloth or wool to produce a dull sheen.

3.03 INSTALLATION:

A. Comply with sealant manufacturer's printed instructions, except where more stringent requirements are indicated or specified and except where manufacturer's technical representative directs otherwise.

B. Prime or seal the joint surfaces wherever shown or recommended by the sealant manufacturer. Do not allow primer/sealer to spill or migrate onto adjoining surfaces.

C. Install sealant backer rod for liquid elastomeric sealants, except where shown to be omitted or recommended to be omitted by sealant manufacturer for the application shown.

D. Install bond breaker tape wherever shown and wherever required by manufacturer's recommendations to ensure that elastomeric sealants will perform properly.

E. Employ only proven installation techniques, which will ensure that sealants will be deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of the joint bond surfaces equally on opposite sides. Except as otherwise indicated, fill sealant rabbet to a slightly concave surface, slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and a vertical surface, fill joint to form a slight cove, so that joint will not trap moisture and dirt.

F. Install sealants to depths as shown or, if not shown, as recommended by the sealant manufacturer but within the following general limitations, measured at the center (thin) section of the bead.
   1. For sidewalks and similar joints sealed with elastomeric sealants and subject to traffic and other abrasion and indentation exposures, fill joints to a depth equal to 75% of joint width, but neither more than 5/8" deep nor less than 3/8" deep.
   2. For normal moving joints sealed with elastomeric sealants, but not subject to traffic, fill joints to a depth equal to 50% of joint width, but neither more than 1/2" deep nor less than 1/4" deep.
   3. For joints sealed with non-elastomeric sealants, fill joints to a depth in the range of 75% to 125% of joint width.

G. Do not allow sealants to overflow or spill onto adjoining surfaces. Use masking tape or other precautionary devices to prevent staining of adjoining surfaces, by either the primer/sealer or the sealant.

H. Remove excess and spillage of sealants promptly as the work progresses. Clean the adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage, without damage to adjoining surface finishes.

3.04 CURE AND PROTECTION: CURE SEALANTS IN COMPLIANCE WITH MANUFACTURER'S INSTRUCTIONS AND RECOMMENDATIONS, TO OBTAIN HIGH EARLY BOND STRENGTH, INTERNAL COHESIVE STRENGTH, AND SURFACE DURABILITY. CURE AND PROTECT SEALANTS IN A MANNER WHICH WILL MINIMIZE INCREASES IN MODULUS OF ELASTICITY AND OTHER ACCELERATED AGING EFFECTS. REPLACE OR RESTORE SEALANTS WHICH ARE DAMAGED OR DETERIORATED DURING CONSTRUCTION PERIOD.

END OF SECTION 07 90 00

SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Hollow metal frames for wood doors.

C. Thermally insulated hollow metal doors with frames.

1.02 RELATED REQUIREMENTS

A. Section 08 71 00 - Door Hardware.

B. Section 08 80 00 - Glazing: Glass for doors and borrowed lites.

C. Section 09 91 13 - Exterior Painting: Field painting.

D. Section 09 91 23 - Interior Painting: Field painting.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2018.

C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2017.

D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2020.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2021a.

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. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

I. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2007.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:
   1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   2. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.

3. Mesker, dormakaba Group; FDJ Series Drywall Frames: www.meskeropeningsgroup.com/#sle.
4. Or approved equal..

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
   1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
   2. Accessibility: Comply with ICC A117.1 and ADA Standards.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

A. Door Finish: Factory primed and field finished.

B. Exterior Doors: Thermally insulated.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 20 gauge, 0.032 inch, minimum.
   2. Door Core Material: Vertical steel stiffeners with fiberglass batts.
   3. Door Thickness: 1-3/4 inches, nominal.
   4. Weatherstripping: Refer to Section 08 71 00.
   5. Door Finish: Factory primed and field finished.

C. Interior Doors, Non-Fire-Rated:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 20 gauge, 0.032 inch, minimum.
   2. Door Thickness: 1-3/4 inches, nominal.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Exterior Door Frames: Full profile/continuously welded type.
   1. Frame Metal Thickness: 18 gauge, 0.042 inch, minimum.
   2. Frame Finish: Factory primed and field finished.
   3. Weatherstripping: Separate, see Section 08 71 00.

C. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
   1. Frame Metal Thickness: 18 gauge, 0.042 inch, minimum.
   2. Frame Finish: Factory primed and field finished.

D. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.

2.05 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.06 ACCESSORIES

A. Door Window Frames: Door window frames with glazing securely fastened within door opening.
   1. Size: 6" inch wide by 2'-6" inch high.
   2. Frame Material: 18 gauge, 0.0478 inch, galvanized steel.

3. Glazing: 1/4 inch thick, tempered glass, in compliance with requirements of authorities having jurisdiction.

B. Glazing: As specified in Section 08 80 00, factory installed.

C. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

D. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Coordinate frame anchor placement with wall construction.

C. Install door hardware as specified in Section 08 71 00.

3.03 TOLERANCES

A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.04 ADJUSTING

A. Adjust for smooth and balanced door movement.

B. Test sound control doors for force to close, latch, and unlatch; adjust as necessary in compliance with requirements.

3.05 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION 08 11 13

SECTION 08 14 16
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush and flush glazed configuration; non-rated.

1.02 RELATED REQUIREMENTS

A. Section 06 20 00 - Finish Carpentry: Wood door frames.

B. Section 08 11 13 - Hollow Metal Doors and Frames.

C. Section 08 71 00 - Door Hardware.

D. Section 08 80 00 - Glazing.

E. Section 09 21 16 - Gypsum Board Assemblies: Bullet-resistant sheathing and wallboard for bullet-resistant partitions and walls.

F. Section 09 91 23 - Interior Painting: Field finishing of doors.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.

D. Samples: Submit two samples of door veneer, [CHOICE TEXT] illustrating wood grain, stain color, and sheen.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging, and inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

2.02 DOORS

A. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
   1. Provide solid core doors at each location.
   2. Wood veneer facing with factory transparent finish as indicated on drawings.

2.03 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.

2.04 DOOR FACINGS

A. Veneer Facing for Transparent Finish: Red oak, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.

2.05 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:

C. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

D. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

E. Provide edge clearances in accordance with the quality standard specified.

2.06 FINISHES - WOOD VENEER DOORS

A. Factory finish doors in accordance with approved sample.

B. Seal door top edge with color sealer to match door facing.

2.07 ACCESSORIES

A. Hollow Metal Door Frames: See Section 08 11 13.

B. Glazed Openings:
   1. Glazing: Single vision units, 1/4 inch thick glass.

C. Glazing: See Section 08 80 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Use machine tools to cut or drill for hardware.

D. Coordinate installation of doors with installation of frames and hardware.

3.03 TOLERANCES

A. Comply with specified quality standard for fit and clearance tolerances.

B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

END OF SECTION 08 14 16

SECTION 08 43 13
– ALUMINUM ENTRANCES, STOREFRONT AND FIXED FRAMING

PART 1 – GENERAL

1.01

A. SUMMARY: Provide materials, labor and equipment necessary to furnish and install architectural aluminum entrance, entrance framing, and fixed windows, complete in accordance with the contract documents and detail drawings.
   1. Section includes:
      a. Aluminum windows
      b. Glass and glazing
      c. Metal panels
      d. Perimeter trims
      e. Sills and stools
      f. All installation hardware and accessories required for a secure installation
      g. Removal and legal disposal of existing windows and related materials
      h. Shims and anchors required for a secure installation
      i. Insulation between window frames and adjacent construction (optional)
      j. Perimeter sealing
   2. Products supplied, but not installed under this section:
      a. Entrances
      b. Entrance hardware
      c. Entrance framing
   3. Related sections:
      a. Section 08800 – Glass and Glazing
      b. Section 07900 – Sealants
      c. Section 08700 – Hardware

B. REFERENCES
   1. American Architectural Manufacturers Association (AAMA)
   2. American Society for Testing Materials (ASTM)

1.02 SYSTEM DESCRIPTION

A. The windows shall be architectural aluminum fixed windows in accordance with ANSI/AAMA 101-93 Voluntary Specifications for Aluminum and Poly Prime Windows and Glass Doors and AAMA 910-93 Voluntary “Life Cycle” Specifications and Test Methods for Architectural Grade Windows Sliding Glass Doors for F-HC65 and F-AW65 rated windows.

B. Test Units
   1. All test unit sizes and configurations shall conform to the minimum size in accordance with ANSI/AAMA 101-93 and AAMA 910-93.
   2. Units submitted for laboratory testing shall be units of the manufacturer’s standard construction, glazed and assembled in accordance with the manufacturer’s specifications and ANSI/AAMA 101-93.

C. Performance Requirements
   1. Air Infiltration: The test specimen shall be tested in accordance with ASTM E283 at a minimum window size of 6’ x 6’ for F-HC65 and 5’ x 8’ for F-AW65. The air infiltration rate shall not exceed 0.06 cfm/ft at a static air pressure differential of 6.24 psf.
   2. Water Resistance: The test specimen shall be tested in accordance with ASTM E547 and STM E331 at a minimum window size of 6’ x 6’ for F-HC65 and 5’ x 8’ for F-AW65. There shall be no leakage as defined in the test method at a static air pressure differential of 12 psf.
   3. Uniform Load Deflection: A minimum static air pressure difference of 65 psf shall be applied in the positive and negative direction in accordance with ASTM E330. There shall be no deflection in excess of 1 U175 of the span of any framing member.

4. Uniform Load Structural Test: A minimum static air pressure difference of 97.5 psf shall be applied in the positive and negative direction in accordance with ASTM E330. The unit shall be evaluated after each load.
5. Component Testing: Window components shall be tested in accordance with procedures described in ANSI/AAMA 101-93.
6. Condensation Resistance Test: (CRF) when tested in accordance with AAMA 1503.1-88, the condensation resistance factor shall not be less than 53.
7. Thermal Transmittance Test: (Conductive U-Value) when tested in accordance with AAMA 1503.1-88, the conductive thermal transmittance (U-Value) shall not be more than 0.59 BTU/hr/sf/°F.
8. Thermal Barrier Tests
    a. Testing shall be in general accordance with AAMA TIR-A8-1990, Structural Performance Poured and Debridged Framing System.
    b. Testing for shrink-back shall be in accordance with the following procedure:
        1) Place a 35 1U4" length of the composite section in an oven at 160°F for a minimum of one (1) hour.
        2) Remove the composite section from the oven and place in freezer at 0°F for a minimum of one (1) hour.
        3) Repeat the process until ninety (90) cycles are complete.
        4) Inspect for shrink-back of the polyurethane material. Shrink-back shall not exceed one percent (1%) of the total length.
        5) Test for loss of stiffness by loading as a beam to produce a deflection of the composite member. This load shall be sufficient to produce a stress in the aluminum equal to 100% of the allowable extreme fiber bending stress.

1.03 SUBMITTALS

A. General: Prepare, review, approve and submit specified submittals in accordance with "Conditions of the Contract". Product data, shop drawings, samples and similar submittals are defined in "Conditions of the Contract".
    1. Submittal purpose
    2. Non-requested submittals
    3. Architect's review

B. Product Data: Submit product data for each type of product specified.

C. Shop Drawings: Submit shop drawings showing layout, profiles and product components, including joint systems, expansion provisions, glazing and sealing details, hardware, anchorage, accessories, finish and colors for all aluminum entrances, storefronts and fixed framing. For special function glazing, indicate IGU connection wiring paths, grommets or wire protection, routing, and location of where wires exit the framing system.

D. Samples: Submit verification samples for window type and finish.

E. Calculations
    1. For approval purposes, provide engineering calculations to demonstrate compliance of window components and assemblies with the specified structural requirements.

F. Quality/Control Submittals
    1. Design Data: All fixed windows shall meet or exceed ANSI/AAMA 101-93 for and AAMA 910-93 for F-HC65 and F-AW65 rated windows.
    2. Test Reports: Submit certified test reports, showing compliance with specified performance characteristics and physical properties.
    3. Certificates: Submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and physical requirements.
    4. Manufacturer's installation instructions.

1.04 QUALITY ASSURANCE

A. Qualifications
    1. Installer Qualifications: The installer shall be a company specializing in the installation of aluminum windows with a minimum of three (3) years of experience.

2. Manufacturer's Qualifications: Manufacturer shall be capable of providing field service representation during construction, approving acceptable installer and approving application method.
3. The window manufacturer shall be engaged in a TQM continuous quality improvement program for a period of not less than five (5) years.
4. To assure the performance specified, the window manufacturer shall test for air infiltration and water resistance at a minimum of two units, per manufacturing line, per shift in accordance with ANSI/AAMA 191-93.

B. Regulatory Requirements
1. Published specifications, standards, tests or recommended methods of trade, industry or governmental organizations apply to work in this section.
2. Meet all handicapped requirements.

C. Certificates/Certifications

D. Field Samples

E. Mock-ups

F. Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements.

G. Pre-installation Testing

1.05 DELIVERY, STORAGE AND HANDLING

A. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

B. Store and handle windows, mullions, trim and hardware in strict compliance with the manufacturer's instructions.

C. Protect all window materials adequately against damage from the elements, construction activities and other hazards before, during and after installation.

1.06 PROJECT CONDITIONS/SITE CONDITIONS

A. Verify existing conditions.

B. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

1.07 WARRANTY

A. Product Warranty: Refer to "Conditions of the Contract" for project warranty provisions.

B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under the Contract Documents.

C. Beneficiary: Issue warranty in the legal name of the project Owner.

D. Warranty Period

E. Windows shall be two (2) years commencing on date of shipment.
a. Insulating glass shall be warranted to be free from defects (excluding breakage) for a period of five (5) years commencing on date of shipment.
b. The installation shall be warranted against defects for one (1) year from date of installation. (Supplied by installer)

1.08 MAINTENANCE

A. Extra Materials: Deliver to Owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels.

PART 2 - PRODUCTS

2.01 MANUFACTURER: KAWNEER IS SPECIFIED; EQUIVALENT SYSTEMS OF EFCO, U.S. ALUMINUM, MANKO, AND VISTA WALL ARE ACCEPTABLE.

2.02 SWINGING GLASS DOORS:

A. Types: 350 medium stile, single acting, sizes as indicated, complete with all hardware, except cylinders.

B. Glass Stops: Beveled or square glass stops for 1/4" infill.

C. Glazing:
   1. Interior Doors: Refer to Section 08800
   2. Exterior Doors: Refer to Section 08800

D. Hardware:
   1. Door-O-Matic 1790
   2. Door-O-Matic RM170
   3. LCN 1460 PA mount
      a. Aluminum Door Manufacturing standard aluminum 1” diameter offset pull with thru-bolt mounting
      b. Aluminum Door Manufacturing standard aluminum 4” mill finish mortised to receive removable mullion
      c. Roton by Hagar 780 HD full mortise x door height required
      d. Dome type floor or wall mount as required
      e. Aluminum Door Manufacturing standard full weathering plus bottom door sweep

2.03 FIXED FRAMING:

A. Trifab II VG 451T, Center Plane, 2” x 4-1/2”, thermally broken flush glazed system for 1” insulated glazing.

B. FINISH: NAAMM AA-C12C42R1x high performance organic coating.

C. Kynar 500 Series; manufacturer’s standard pre-treatment complying with coating and resin manufacturer’s written instructions.

D. Manufacturer’s standard two-coat thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70% polyvinylidene fluoride resin by weight; complying with AAMA 605.2.

E. Color: As selected by Architect.

2.04 OTHER MATERIALS:

A. Provide all other materials, not specifically described but required for a complete, weathertight, and proper installation of doors and framing systems, subject to acceptance by the Architect.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Install in compliance with manufacturer's specifications, recommendations and final shop drawings.

B. Set units plumb, level and true to line, without warp or rack of framing, doors and windows. Anchor securely in place. Provide sub-frames as detailed. Secure to structure with non-staining, non-corrosive shims, anchors, fasteners, spacers, and fillers. Use care in erection so as not to mar, abrade, or stain finished surfaces.

C. Adjust operating hardware to provide a tight fit at contact points and at weatherstripping for smooth operation and weathertight closure. Lubricate hardware and other moving parts.

D. Where aluminum is to be placed in contact with steel, concrete and other dissimilar surface, back paint the aluminum before erection with an acceptable bituminous paint.

E. Seal frames with an approved sealant in color to match frames, making a neat fully weatherproof job. Refer to Section 07900, and comply with requirements of that section.

F. Protection: After erection, adequately protect exposed parts of work.

G. Cleaning: After completion of other work in the vicinity of aluminum doors and framing, thoroughly clean finished surfaces as recommended by manufacturer.

END OF SECTION 08 43 13

SECTION 08 71 00
DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for wood, aluminum, hollow metal, and Sectional doors.

B. Lock cylinders for doors that hardware is specified in other sections.

C. Thresholds.

D. Weatherstripping and gasketing.

1.02 SUBMITTALS

A. 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.

B. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
   1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
   2. Provide complete description for each door listed.
   3. Provide manufacturer name, product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.
   4. Include account of abbreviations and symbols used in schedule.

1.03 REFERENCE STANDARDS

A. BHMA A156.1 - Standard for Butts and Hinges; 2021.

B. BHMA A156.2 - Bored and Preassembled Locks and Latches; 2022.

C. BHMA A156.3 - Exit Devices; 2020.

D. BHMA A156.4 - Door Controls - Closers; 2019.

E. BHMA A156.5 - Cylinders and Input Devices for Locks; 2020.

F. BHMA A156.6 - Standard for Architectural Door Trim; 2021.

1.04 WARRANTY

A. Manufacturer's Warranty: Provide warranty against defects in material and workmanship for period indicated. Complete forms in Owner's name and register with manufacturer.
   1. Closers: Five years, minimum.
   2. Exit Devices: Three years, minimum.

B. BHMA A156.13 - Mortise Locks & Latches Series 1000; 2022.
   1. Locksets and Cylinders: Three years, minimum.
   2. Other Hardware: Two years, minimum.

C. BHMA A156.16 - Auxiliary Hardware; 2023.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

B. BHMA A156.18 - Materials and Finishes; 2020.

C. Provide door hardware products that comply with the following requirements:
   1. Applicable provisions of federal, state, and local codes.

D. BHMA A156.21 - Thresholds; 2019.

E. BHMA A156.22 - Standard for Gasketing; 2021.
   1. Hardware on Fire-Rated Doors: Listed and classified by UL (DIR), ITS (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for application indicated.

F. BHMA A156.28 - Standard for Recommended Practices for Mechanical Keying Systems; 2023.

G. BHMA A156.31 - Electric Strikes and Frame Mounted Actuators; 2019.
   1. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.
   2. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified.

H. Electrically Operated and/or Controlled Hardware: Provide necessary power supplies, power transfer hinges, relays, and interfaces as required for proper operation; provide wiring between hardware and control components and to building power connection in compliance with NFPA 70.

I. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames; 2006.

J. Fasteners:
   1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.

K. DHI (KSN) - Keying Systems and Nomenclature; 2019.

L. ITS (DIR) - Directory of Listed Products; Current Edition.

2.02 HINGES

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.

C. Hinges: Comply with BHMA A156.1, Grade 1.
   1. Provide hinges on every swinging door.

D. UL (DIR) - Online Certifications Directory; Current Edition.
   1. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
   2. Provide ball-bearing hinges at each door with closer.
   3. Provide non-removable pins on exterior outswinging doors.
   4. Provide power transfer hinges where electrified hardware is mounted in door leaf.
   5. Provide following quantity of butt hinges for each door:
      a. Doors From 60 inches High up to 90 inches High: Three hinges.
      b. Doors 90 inches High up to 120 inches High: Four hinges.

2.03 PIVOTS

A. Center-Hung and Offset Pivots: Comply with BHMA A156.4.

B. Door Weight: Medium; standard openings with up to 650 lbs door weight.

C. See Section 01 30 00 - Administrative Requirements for submittal procedures.

2.04 EXIT DEVICES

A. Exit Devices: Comply with BHMA A156.3, Grade 1.
   1. Lever design to match lockset trim.
   2. Provide cylinder with cylinder dogging or locking trim.
   3. Provide exit devices properly sized for door width and height.
   4. Provide strike as recommended by manufacturer for application indicated.
   5. Provide UL (DIR) listed exit device assemblies for fire-rated doors and panic device assemblies for non-fire-rated doors.

B. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

C. Provide individual items of single type, of same model, and by same manufacturer.

2.05 ELECTRIC STRIKES

A. Electric Strikes: Comply with BHMA A156.31, Grade 1.
   1. Provide UL (DIR) listed burglary-resistant electric strike; style to suit locks.
   2. Provide non-handed 24 VDC electric strike suitable for door frame material and scheduled lock configuration.
   3. Provide field selectable Fail Safe/Fail Secure modes.
   4. Provide transformer and rectifier as necessary for complete installation.

5. Connect electric strikes into fire alarm where non-rated doors are scheduled to release with fire or sprinkler alarm condition.
    a. Aluminum fasteners are not permitted.
    b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.

2.06 LOCK CYLINDERS

A. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
1. Provide standard type cylinders, Grade 1, with seven-pin core in compliance with BHMA A156.5 at locations indicated.
2. Fire-Rated Applications: Comply with NFPA 80.
3. Provide cylinders from same manufacturer as locking device.
    a. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.
    b. Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.
4. Provide cams and/or tailpieces as required for locking devices.
5. Within specific Door Sections, when provisions for lock cylinder are being referenced to this Section, provide specified lock cylinder and keyed to building keying system, unless otherwise indicated.

2.07 CYLINDRICAL LOCKS

A. Cylindrical Locks (Bored): Comply with BHMA A156.2, Grade 1, 4000 Series.
1. Bored Hole: 2-1/8 inch diameter.
2. Latchbolt Throw: 1/2 inch, minimum.
3. Backset: 2-3/4 inch unless otherwise indicated.
4. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
    a. Finish: To match lock or latch.
    b. Aluminum-Frame Strike Box: Provide strike box fabricated for use with aluminum framing by framing manufacturer.
5. Provide a lock for each door, unless otherwise indicated that lock is not required.

B. Locking Functions:
1. Passage: Both levers always unlocked and always free for immediate ingress and egress.
2. Entry/Office:Unlocked by key from outside when outside lever is locked by turn-button on inside lever.Inside lever always unlocked and available for immediate egress.

2.08 MORTISE LOCKS

A. Mortise Locks: Comply with BHMA A156.13, Grade 1, Security, 1000 Series.
1. Latchbolt Throw: 3/4 inch, minimum.
2. Deadbolt Throw: 1 inch, minimum.
3. Backset: 2-3/4 inch unless otherwise indicated.
4. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
    a. Finish: To match lock or latch.

2.09 DOOR PULLS AND PUSH PLATES

A. Door Pulls and Push Plates: Comply with BHMA A156.6.
1. Pull Type: Straight, unless otherwise indicated.
2. Push Plate Type: Flat, with square corners, unless otherwise indicated.
    a. Edges: Beveled, unless otherwise indicated.
3. Material: Aluminum, unless otherwise indicated.
4. Provide door pulls and push plates on doors without a lockset, latchset, exit device, or auxiliary lock unless otherwise indicated.
5. On solid doors, provide matching door pull and push plate on opposite faces.

2.10 CLOSERS

A. Closers: Comply with BHMA A156.4, Grade 1.
   1. Type: Surface mounted to door.
   2. Provide door closer on each exterior door.
   3. Provide door closer on each fire-rated and smoke-rated door.

2.11 KICK PLATES

A. Kick Plates: Provide along bottom edge of push side of every door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
   1. Size: 8 inch high by 2 inch less door width (LDW) on push side of door.

2.12 DOOR HOLDERS

A. Door Holders: Comply with BHMA A156.16, Grade 1.
   1. Type: Lever, or kick down stop, with rubber bumper at bottom end.
   2. Material: Aluminum.

2.13 WALL STOPS

A. Wall Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
   1. Type: Bumper, concave, wall stop.
   2. Material: Aluminum housing with rubber insert.

2.14 THRESHOLDS

A. Thresholds: Comply with BHMA A156.21.
   1. Provide threshold at each exterior door, unless otherwise indicated.
   2. Type: Flat surface.
   3. Material: Aluminum.
   4. Threshold Surface: Fluted horizontal grooves across full width.
   5. Field cut threshold to profile of frame and width of door sill for tight fit.

2.15 WEATHERSTRIPPING AND GASKETING

A. Weatherstripping and Gasketing: Comply with BHMA A156.22.
   1. Head and Jamb Type: Adjustable.
   2. Door Sweep Type: Encased in retainer.
   3. Material: Aluminum, with brush weatherstripping.
   4. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated.
   5. Provide door bottom sweep on each exterior door, unless otherwise indicated.

2.16 SILENCERS

A. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.
   1. Single Door: Provide three on strike jamb of frame.
   2. Pair of Doors: Provide two on head of frame, one for each door at latch side.
   3. Material: Rubber, gray color.

2.17 KEY CONTROL SYSTEMS

A. Key Control Systems: Comply with guidelines of BHMA A156.28.
   1. Keying: Factory key, master key, and grand master key.
   2. Furnish three keys for each lock, three masterkeys for each set and three grand-masterkeys.
   3. Identification and delivery:
      a. Factory stamp permanent keys, "DO NOT DUPLICATE", where directed.
      b. Identify permanent keys with tags and send direct to the owner by registered mail or receipted personal delivery.
   4. Include construction keying and control keying with removable core cylinders.
   5. Key to existing keying system.
   6. Key Management System: For each keyed lock on project, provide one set of consecutively numbered duplicate key tags with hanging hole and snap catch.

2.18 FIRE DEPARTMENT LOCK BOX

A. Fire Department Lock Box: Contact Conway Fire Marshall. Knoxbox 3200 Hinged Recessed. Code for ordering to be keyed for CFD PS-20-0034-03-02
   1. Capacity: Holds 10 keys.
   2. Finish: Manufacturer's standard dark bronze.

2.19 KEY PAD

A. Key Pad: Indoor or outdoor use, 12-key digital keypad with silicone rubber keys, and compatible with access control systems using standard Wiegand output.
   1. Power: 12 VDC; 35mA Active and 7mA at Rest.
   2. Mounts on narrow mullion, 1-1/2 inch wide by 7 inch high by 1 inch deep.

2.20 EXIT SWITCH

A. Exit Switch: 4 3/4" x 3" Button Switch
   1. Power: 12 VDC.
   2. 1 billion cycle life expectancy
   3. Piezoelectric Button Green & Red Illumination

2.21 FINISHES

A. Finishes: Provide door hardware of same finish, unless otherwise indicated.
   1. Primary Finish: 626; satin chromium plated over nickel, with brass or bronze base material (former US equivalent US26D); BHMA A156.18.
   2. Secondary Finish: 625; bright chromium plated over nickel, with brass or bronze base material (former US equivalent US26); BHMA A156.18.
      a. Use secondary finish in kitchens, bathrooms, and other spaces containing chrome or stainless steel finished appliances, fittings, and equipment; provide primary finish on one side of door and secondary finish on other side if necessary.
   3. Exceptions:
      a. Where base material metal is specified to be different, provide finish that is an equivalent appearance in accordance with BHMA A156.18.
      b. Door Closer Covers and Arms: Color as selected by Architect from manufacturer's standard colors unless otherwise indicated.
      c. Aluminum Surface Trim and Gasket Housings: Anodized to match door panel finish, not other hardware, unless otherwise indicated.
      d. Hardware for Aluminum Entrance Doors: Finished to match door panel finish, except at hand contact surfaces provide stainless steel with satin finish, unless otherwise indicated.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Use templates provided by hardware item manufacturer.

3.02 ADJUSTING

A. Adjust hardware for smooth operation.

3.03 HARDWARE SETS

A. The following hardware sets are intended to establish type and standard of quality when used together with the requirements of this section. Examine Drawings and Specifications and furnish proper hardware for door openings. All hardware shall be installed in accordance with Americans With Disabilities Act (ADA requirements.
   1. Hinges: Hager BB1279 4.5”x4.5”
   2. Pivots: Kawneer Offset Pivots
   3. Threshold: Hager 410S
   4. Weatherstrip: Hager 891S
   5. Door Sweep: Hager 750S
   6. Closer: Hager 5400 Series
   7. Wall Stops: Hager 236W-US32D

8. Silencers: Hager 307D
9. Door Pull: Kawneer CO-12
10. Panic Exit: Kawneer 1786
11. Kick Plate: Hager 193S 12”-US32D
12. Surface Bolts: Hager 279D
13. Lever: Hager 3400 Series Withnell
14. Storage Lever Set: Hager 3901
15. Entry/Office Lever Set: Hager 3901
16. Passage Lever Set: Hager 3901
17. Privacy Set: Schlage Deadbolt B571 Occupancy Indicator
18. Classroom Set: Hager 3901
19. Intruder Classroom: Hager 3901
20. Cylinder Only: Hager 3901
21. Electric Strike: Hess 9600 Surface Mounted with Buzzer
22. Key Pad: Hager 9515
23. Exit Switch Hager 2977

B. **HW-1:**
1. 1 ea. Cylinder
2. 1 ea. Electric Strike
3. 1 ea. Key Pad
4. 1 ea. Exit Switch
5. 1 ea. Panic Exit
6. Balance by Door Supplier

C. **HW-2:**
1. 3 ea. Hinges
2. 1 ea. Office Lever Set
3. 3 ea. Silencers
4. 1 ea. Wall Stop
5. 1 ea. Closer
6. 2 ea. Kickplate (1 ea side of door)

D. **HW-3:**
1. 3 ea. Hinges
2. 1 ea. Privacy Set
3. 1 ea. Passage Lever
4. 3 ea. Silencers
5. 1 ea. Wall Stop
6. 1 ea. Closers
7. 2 ea. Kickplate (1 ea side of door)

E. **HW-4:**
1. 3 ea. Hinges
2. 1 ea Classroom Lever Set
3. 3 ea. Silencers
4. 1 ea. Wall Stop
5. 3 ea. Close

F. **HW-5:** (Dutch Door)
1. 4 ea. Hinges
2. 1 ea. Passage Lever Set
3. 3 ea. Silencers
4. 1 ea. Wall Stop

5. 1 ea. Closer
6. 2 ea. Kick plate (1 ea side of Door)
7. 1 ea. Surface Bolt

G. **HW-6:**
1. 3 ea. Hinges
2. 3 ea. Silencers
3. 1 ea. Storage Level set

H. **HW-7:**
1. 3 ea. Hinges (NRP)
2. 3 ea. Silencers
3. 1 ea. Closer
4. 1 ea. Intruder Classroom Set
5. 1 ea. Threshold
6. 1 ea. Weatherstripping
7. 1 ea. Door Sweep

I. **HW-8:**
1. 3 ea. Hinges (NPR)
2. 3 ea. Silencers
3. 1 ea. Closer
4. 1 ea. Intruder Classroom Set
5. 1 ea. Threshold
6. 1 ea. Weatherstripping
7. 1 ea. Door Sweep
8. 1 ea. Buzzer

J. **HW-9**
1. 3 ea Hings (NPR)
2. 3 ea. Silencers
3. 1 ea. Electric Strike
4. 1 ea. Closer
5. 1 ea. Pull
6. 1 ea. Exit Device
7. 1 ea. Threshold
8. 1 ea. Door Sweep
9. 1 ea. Key Pad
10. 1 ea. Exit Switch

END OF SECTION

1. Provide non-corroding fasteners at exterior locations.
2. Provide keying information in compliance with DHI (KSN) standards.
3. Supply keys in following quantities:
   a. 6 each Construction Master keys.
   b. 15 each Construction keys.
   c. 2 each Construction Control keys.
   d. 2 each Control keys if new system.
4. Operating Temperature: Minus 22 to 158 degrees F.
5. Finish: Black.
6. Operating Temperature: 32 to 110 degrees F.

B. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.

C. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

D. Adjust work under provisions of Section 01 70 00 - Execution and Closeout Requirements.

E. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

4.02 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.

C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

4.03 PROTECTION

A. Protect finished Work under provisions of Section 01 78 00 Closeout Requirements.

B. Do not permit adjacent work to damage hardware or finish.

SECTION 08 80 00
GLAZING

PART 1 - GENERAL

1.01 SCOPE: PROVIDE GLASS AND GLAZING, COMPLETE, EXCEPT GLASS FOR ALUMINUM WINDOWS WILL BE SUPPLIED AND INSTALLED UNDER ITS RESPECTIVE SECTION.

1.02 QUALITY ASSURANCE: PROVIDE SAFETY GLASS (TEMPERED). COMPLYING WITH REQUIREMENTS OF ANSI Z97.1 AND CPSC 26 CRF 1201 CII, WITH ETCHED OR CERAMIC FIRED PERMANENT IDENTIFICATION VISIBLE ON GLASS WHEN GLAZED. LABEL EACH PIECE OF GLASS INDICATING COMPLIANCE WITH REQUIREMENTS. DO NOT REMOVE LABEL PRIOR TO INSTALLATION.

1.03 SUBMITTALS: COMPLY WITH SECTION 01300.

A. Product Data: Submit copy of manufacturer's specifications and installation instructions for each type of glass and glazing material. Include test data of certification substantiating that glass complies with specified requirements.

B. Samples: Prior to ordering, submit minimum 6" X 6" sample of each type and thickness of glass required for Architect's review.

1.04 PROTECTION: PROTECT GLASS SURFACES AND EDGES AT ALL TIMES DURING THE CONSTRUCTION PERIOD. KEEP GLASS FREE FROM CONTAMINATION BY MATERIALS CAPABLE OF STAINING GLASS.

PART 2 - PRODUCTS

2.01 GLASS: CONFORMING TO ASTM C 1036, OF THE VARIOUS TYPES, CLASSES, AND FORMS SPECIFIED.

1. Float Glass: Type I, Class 1 (transparent), Quality q3 (glazing select).
2. Tempered Glass: Types specified above, heat-strengthened (after cutting to final size) to 4 times normal strength, by process designed to eliminate tong marks or by vertical process if glass is installed to conceal tong marks.
3. Mirror Glass: Type I, Class 1 (transparent), Quality q2 (mirror), with silver coating, copper protective coating complying with CS27, and 2 mil thick painting coating; 1/4" thick.
4. Insulated Glazing:
   a. Interior Doors: 1/4" thick tinted tempered float glass
   b. Exterior doors: 3/4" thick, consisting of 1/4" gray tinted tempered float, 1/4" air space, and 1/4" clear tempered float. Energy Low-E glass with the coating on the #3 surface as manufactured by Libby-Owens-Ford Co. The center-of-glass area will provide the following performance characteristics:
      1) Winter U-Values not to exceed .35 BTU/hour/square foot/degree Fahrenheit.
      2) Summer U-Values not to exceed .39 BTU/hour/square foot/degree Fahrenheit.
      3) Average daylight transmittance of 37%.
      4) Shading coefficient (no shade) not to exceed .53.
      5) The Low-E coating will meet the coating quality specifications as published by the manufacturer of the coated glass.
      6) (Note: Tempered lites not required at transoms.)
   c. Windows: 1" thick, consisting of 1/4" gray tinted tempered float, 1/4" air space, and 1/4" clear tempered float. Energy Low-E glass with the coating on the #3 surface as manufactured by Libby-Owens-Ford Co.; furnished and installed under Section 08520. The center-of-glass area will provide the following performance characteristics:
      1) Winter U-Values not to exceed .35 BTU/hour/sq. ft./deg. F.
      2) Summer U-Values not to exceed .39 BTU/hour/sq. ft./deg.F.
      3) Average daylight transmittance of 37%.
      4) Shading coefficient (no shade) not to exceed .53.
      5) The Low-E coating will meet the coating quality specifications as published by the manufacturer of the coated glass.
5. Wire Glass: Type II, Class 1 (clear), Form 1 (wired and polished both sides), 1/4" thick welded square mesh.

2.02 GLAZING MATERIALS: PROVIDE MATERIALS WITH PROVEN RECORD OF COMPATIBILITY WITH SURFACES CONTACTED IN INSTALLATION.

1. Glazing Sealants: Tremco "Proglaze", Bostik "Chem-Calk 1200", Pecora "863", or Sonneborn "Omniglaze".
2. Glazing Gaskets: Structural rubber, molded neoprene, or cellular neoprene as recommended by manufacturer of glazing system.
3. Glazing Tape: Dap "Butyl Rubber Tape", Woodmont "Chem Tape 40", Tremco "440".
4. Setting Blocks: Neoprene or other resilient blocks of 70 to 90 shore A durometer hardness, adhesively backed on one face only, tested for compatibility with specified glazing sealants.
5. Spacers: Neoprene or other resilient blocks of 40 to 50 Shore A durometer hardness, tested for compatibility with specified glazing sealant.
6. Compressible Filler Rod: Closed-cell or waterproof-jacketed foam of polyethylene, butyl rubber, neoprene, polyurethane or vinyl, tested for compatibility with specified glazing sealants, of 5 to 10 psi compression strength (25% coverage), recommended by sealant manufacturer for use in glazing channel to prevent sealant exudation from the channel.
7. Mirror Mastic: An adhesive setting compound, produced specifically for setting mirrors by spot application method (25% coverage) without support, to be used in 1/8" to 1/2" thickness.

PART 3 - EXECUTION

3.01 INSTALLATION: COMPLY WITH RECOMMENDATIONS OF GLASS MANUFACTURERS AND MANUFACTURERS OF SEALANTS AND OTHER GLAZING MATERIALS, UNLESS OTHERWISE INDICATED OR SPECIFIED, INCLUDING PREPARATION OF SURFACES.

1. Clean channel surfaces and prime as recommended by sealant manufacturer.
2. Cut glass to size as required for measured opening, provide adequate edge clearance and glass bite all around. Cut prior to tempering.
3. Do not install sheets which have edge damage or face imperfections.
4. Miter-cut and bond (weld) ends of channel gaskets at corners to provide a continuous gasket.
5. Seal face gaskets at corners with liquid elastomeric sealant to close openings and prevent withdrawal of gaskets from corners.
6. Frameless Mirror: Mirror glass, with edges ground. Apply one additional coat of moisture-resistant paint, of type recommended by mirror manufacturer, to back of mirror, and allow to dry. Coat edges of mirror with clear sealant, PPG UC-4401 mirror edge seal, or acceptable equal. Apply mirror mastic to cover not more than 25% of back of mirror. Set mirror in support on setting blocks and press against substrate to ensure bond of adhesive. Leave open ventilation space, 1/8" or more in thickness between mirror and substrate, over 75% of mirror area (wherever there is no adhesive). Do not seal off ventilation space at edges of mirror. Hold in place with masking tape, braces or mechanical clamps until mastic sets (about 1 week).
7. Remove and replace glass which is broken, chipped, cracked, abraded or damaged during the construction period.

3.02 CURING: CURE GLAZING SEALANTS AND COMPOUNDS IN COMPLIANCE WITH MANUFACTURER'S INSTRUCTIONS AND RECOMMENDATIONS TO OBTAIN HIGH EARLY BOND STRENGTH, INTERNAL COHESIVE STRENGTH AND SURFACE DURABILITY.

END OF SECTION 08 80 00

SECTION 09 05 61
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
   1. Resilient tile and sheet.
   2. Thin-set ceramic tile and stone tile.

B. Preparation of new concrete floor slabs for installation of floor coverings.

C. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
   1. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.

D. Patching compound.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Moisture emission reducing curing and sealing compound for slabs to receive adhered flooring, to prevent moisture content-related flooring failures; to remain in place, not to be removed.

1.03 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens); 2021.

B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete; 2020.

PART 2 PRODUCTS

2.01 MATERIALS

A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
   1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
   2. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:
   1. Preliminary cleaning.
   2. Specified remediation, if required.
   3. Patching, smoothing, and leveling, as required.
   4. Other preparation specified.
   5. Adhesive bond and compatibility test.
   6. Protection.

3.02 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

END OF SECTION 09 05 61

SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Metal stud wall framing.

C. Acoustic insulation.

D. Gypsum sheathing.

E. Gypsum wallboard.

F. Joint treatment and accessories.

G. Textured finish system.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Building framing and sheathing.

B. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

C. Section 07 25 00 - Weather Barriers: Water-resistive barrier over sheathing.

D. Section 07 92 00 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

1.03 REFERENCE STANDARDS

A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017.

B. ASTM C514 - Standard Specification for Nails for the Application of Gypsum Board; 2004 (Reapproved 2020).

C. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2020.

D. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.

E. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

F. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2019.

G. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2019, with Editorial Revision (2020).

H. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.

I. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

J. ASTM E413 - Classification for Rating Sound Insulation; 2016.

K. GA-216 - Application and Finishing of Gypsum Panel Products; 2018.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:

1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

2.02 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:

1. American Gypsum Company; ____: www.americangypsum.com/#sle.

2. CertainTeed Corporation; ____: www.certainteed.com/#sle.
3. Georgia-Pacific Gypsum; ____: www.gpgypsum.com/#sle.
4. PABCO Gypsum; ____: www.pabcogypsum.com/#sle.
5. or approved equal..

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
2. Glass mat faced gypsum panels, as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
4. Thickness:
a. Vertical Surfaces: 5/8 inch.
b. Ceilings: 5/8 inch.
5. Paper-Faced Products:

C. Impact Resistant Wallboard:
1. Application: Install from FFE to 8'-0 high in all areas..
2. Surface Abrasion: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
3. Soft Body Impact: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
4. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
5. Type: Fire-resistance-rated Type X, UL or WH listed.
6. Thickness: 5/8 inch.
7. Edges: Tapered.

D. Exterior Sheathing Board: See Section 06 10 00.

E. Exterior Sheathing Board: Sizes to minimize joints in place; ends square cut.
1. Application: Exterior sheathing, unless otherwise indicated.
2. Edges: Square.

2.03 GYPSUM BOARD ACCESSORIES

A. Water-Resistive Barrier: See Section 07 25 00.

B. Finishing Accessories: ASTM C1047, extruded aluminum alloy (6063 T5) or galvanized steel sheet ASTM A924/A924M G90, unless noted otherwise.
1. Types: As detailed or required for finished appearance.

C. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
1. Corner Beads: Low profile, for 90 degree outside corners.
2. Control Joints:
a. Type: V-shaped PVC with tear away fins.

D. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Paper Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
2. Joint Compound: Drying type, vinyl-based, field-mixed.

E. Nails for Attachment to Wood Members: ASTM C514.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

A. Studs: Space studs at 16 inches on center.
1. Extend partition framing to structure where indicated and to ceiling in other locations.
2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.

B. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

C. Blocking: Install wood blocking for support of:
   1. Wall-mounted cabinets.
   2. Toilet accessories.
   3. Wall-mounted door hardware.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.

3.04 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Installation on Wood Framing: For rated assemblies, comply with requirements of listing authority. For nonrated assemblies, install as follows:
   1. Single-Layer Applications: Screw attachment.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
   1. Not more than 30 feet apart on walls and ceilings over 50 feet long.

B. Corner Beads: Install at external corners, using longest practical lengths.

3.06 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   2. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
   3. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.

B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.

3.07 TEXTURE FINISH

A. Apply finish texture coating by means of spraying apparatus in accordance with manufacturer's instructions and to match approved sample.

B. Texture Required: knock down.

END OF SECTION 09 21 16

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Acoustical units.

1.02 RELATED REQUIREMENTS

A. Section 07 21 00 - Thermal Insulation: Acoustical insulation.

1.03 REFERENCE STANDARDS

A. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2017.

B. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2019.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on suspension system components and acoustical units.

1.05 QUALITY ASSURANCE

1.06 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
   2. CertainTeed Corporation: www.certainteed.com/#sle.
   3. USG Corporation: www.usg.com/ceilings/#sle.
   4. or approved equal..

B. Suspension Systems:
   1. Same as for acoustical units.

2.02 ACOUSTICAL UNITS

A. Acoustical Panels Armstrong Fine Fissured 2806: "ACT -1" as indicated on drawings. Painted mineral fiber, with the following characteristics:
   1. Classification: ASTM E1264 Type III.
      a. Form: 2, water felted.
      b. Pattern: "D" - fissured.
   2. Size: 24 by 24 inches.
   3. Thickness: 3/4 inch.
   4. Panel Edge: Square.
   5. Tile Edge: Square.
   6. Color: White.
   7. Suspension System: Exposed grid.
   8. Products:
      a. Armstrong World Industries, Inc; Fine Fissured: www.armstrongceilings.com/#sle.

B. Acoustical Panels, Type ____: Mineral fiber with membrane-faced overlay, with the following characteristics:
   1. Application(s): Clean room.
   2. Classification: ASTM E1264 Type IV.
      a. Form: 1, nodular.
      b. Pattern: "E" - lightly textured.
   3. Size: 24 by 24 inches.
   4. Panel Edge: Square.

5. Suspension System Type _____: Exposed grid.

2.03 SUSPENSION SYSTEM(S)

A. Exposed Suspension System: Hot-dipped galvanized steel grid with aluminum cap.
   1. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
   2. Profile: Tee; 15/16 inch face width.
   3. Finish: Baked enamel.
   4. Color: White.

2.04 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.

C. Perimeter Moldings: Same metal and finish as grid.

D. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

3.03 INSTALLATION - SUSPENSION SYSTEM

A. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

B. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.

C. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

D. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

E. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

F. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

G. Do not eccentrically load system or induce rotation of runners.

3.04 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:
   1. Make field cut edges of same profile as factory edges.

3.05 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION 09 51 00

SECTION 09 66 28
HIGH-BUILD SMOOTH FINISH EPOXY CONDUCTIVE ESD

GENERAL

1.01 SECTION INCLUDES

A. Labor, products, equipment and services necessary for resinous flooring Work in accordance with the Contract Drawings covering the following components:
   1. Primer: Sikafloor® 161.
   2. Conductive Black Primer: Sikafloor® 220W
   3. Top Coat: Sikafloor® 200C ESD.

1.02 REFERENCE STANDARDS

A. ASTM C579 - Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes; 2018.

B. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015 (Reapproved 2021).

C. ASTM D2369 - Standard Test Method for Volatile Content of Coatings; 2020.

D. ASTM D4060 - Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser; 2025.

E. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers; 2017.

F. ASTM F150 - Standard Test Method for Electrical Resistance of Conductive and Static Dissipative Resilient Flooring; 2006 (Reapproved 2018).

G. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

H. ISO 9001 - Quality Management Systems — Requirements; 2015.

1.03 RELATED SECTIONS

A. Section 03 01 00 - Concrete Rehabilitation.

1.04 REFERENCES

A. ASTM C579, Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.

B. ASTM D2240, Standard Test Method for Rubber Property—Durometer Hardness.

C. ASTM D2369, Standard Test Method for Volatile Content of Coatings.

D. ASTM D4060, Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.

E. ASTM D4541, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.

F. For additional standards please refer to Product Data Sheets

1.05 SUBMITTALS

A. Comply with Section 01 33 00 - Submittal Procedures.

B. Product Data: Submit manufacturer's product data, including physical properties and colors available.

C. Manufacturer’s Safety Data Sheet for each product being used.

D. Product Samples: Submit Architectural Standard samples representative of the final finish, as applied. The Standard shall be approved in writing by the Architect and shall be the final standard of acceptance of the finish.

E. Maintenance Instructions: Submit manufacturer's maintenance instructions.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Acceptable Manufacturer: Sika Corporation, 201 Polito Drive, Lyndhurst, NJ 07071

a. No request for substitution shall be considered that would change the generic type of system specified. Equivalent materials of other manufacturers may be substituted only on approval of the Architect or Engineer. Requests for substitution will be considered only if submitted 10 days prior to bid date. Requests shall include the respective manufacturer's technical literature for each product giving the name, generic type, descriptive information, recommended dry film thickness (DFT), Material Safety Data Sheet (MSDS), and certified test reports showing results to equal performance criteria of products specified herein.

B. Applicator Qualifications:
   1. Pre-Qualification: Each bidder for this project shall be pre-qualified and approved in writing by the material manufacturer.
   2. Applicator Experience: Each bidder must have a minimum 5 years experience in the application of the type of system specified. Contractor shall submit a list of five projects of similar size, scope and complexity.

C. Mock-Up:
   1. Construct one 100 sq.ft. (10 sq.m.) mock-up of each type and color of resinous flooring in location acceptable to Architect/Engineer to demonstrate quality of finished system, complying with manufacturer's instructions.
   2. Arrange for Architect/Engineer's review and acceptance, obtain written acceptance before proceeding with Work.
   3. Upon acceptance, mock-up shall serve as a minimum standard of quality for the balance of the work of this Section. Mock-up shall be left in place for the duration of the work.

D. Pre-application Meeting: Convene a pre-application meeting two (2) weeks before start of application of floor coating. Require attendance of parties directly affecting work of this section, including Contractor, Architect, applicator, and manufacturer's representative. Review surface preparation, priming, application, curing, protection, and coordination with other work.

1.07 DELIVERY, STORAGE AND HANDLING

A. Delivery:
   1. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name, manufacturer, batch or lot number, and date of manufacture.
   2. Material should be delivered to job site and checked for completeness and shipping damage prior to job start.

B. Storage:
   1. Store materials in accordance with manufacturer's written instructions.
   2. Keep containers sealed until ready for use. Material should be stored in a dry, enclosed, protected area from the elements.
   3. Do not subject material to excessive heat or freezing.
   4. Shelf life: Established based on manufacturer's written recommendation for each material being used.

C. Handling: Protect materials during handling and application to prevent damage or contamination.

D. Condition materials for use accordingly to manufacturer's written instructions prior to application.

E. Record material lot number and quantity delivered to jobsite/storage.

1.08 SITE CONDITIONS

A. Do not install the Work of this Section outside of the following environmental ranges with Manufacturers' written acceptance:
   1. SPECIFIER'S NOTE:
   2. Note: Low Relative Ambient Humidity may result in slower cure.
   3. Dew Point: Beware of condensation!
   4. The substrate must be at least 5˚F (3˚C) above the Dew Point to reduce the risk of condensation, which may lead to adhesion failure or "blushing" on the floor finish. Be aware that the substrate temperature may be lower than the ambient temperature.
   5. Material Temperature: Precondition material for at least 24 hours between 65° to 75°F (18° to 24°C)

6. Ambient Temperature: Minimum/Maximum 50˚/85˚F (10˚/30˚C)
7. Substrate Temperature: Minimum/Maximum 50˚/85˚F (10˚/30˚C). Substrate temperature must be at least 5˚F (3˚C) above measured Dew Point.
8. Mixing and Application attempted at Material, Ambient and/or Substrate Temperature conditions less than 65˚F (18˚C) will result in a decrease in product workability and slower cure rates.
9. Relative Ambient Humidity: Minimum ambient humidity 30%, maximum ambient humidity 75% (during application and curing)
10. Measure and confirm Substrate Moisture Content, Ambient Relative Humidity, Ambient and Surface Temperature and Dew Point.
11. Substrate moisture:
12. Moisture content of concrete substrate must be ≤ 4% by mass as measured with a Tramex® CME/CMExpert type concrete moisture meter.
13. Additionally, relative humidity tests may be conducted per ASTM F2170 and values must be ≤ 85%.
14. If moisture content of concrete substrate is > 4% by mass as measured with Tramex® CME/CMExpert type and/or if relative humidity tests per ASTM F2170 exceed values ??? 85%, consider moisture mitigation systems or moisture tolerant primer.

B. Utilities, including electric, water, HVAC and permanent lighting to be supplied by General Contractor

C. Maintain constant ambient room temperature of plus or minus 15ºF (plus or minus 7ºC) with a minimum temperature of 50ºF (10ºC) and maximum temperature of 85ºF (30ºC). Maintain constant ambient room temperature for 48 hours before, during and after installation, or until cured. Do not apply while ambient and temperatures are rising.

D. Erect suitable barriers and post legible signs at points of entry to prevent traffic and trades from entering the work area during application and cure period of the floor.

E. Protection of finished floor from damage by subsequent trades shall be the responsibility of the General Contractor.

F. Insure adequate ventilation and air flow.

1.09 WARRANTY

A. Manufacturer's warranty covering the resinous flooring against defects in materials for one year from date of installation.

PRODUCTS

2.01 MANUFACTURER

A. Manufacturer shall be certified under ISO 9001: 2008 All liquid materials, including primers, resins, curing agents, finish coats, and sealants are manufactured and tested under an ISO 9001:2008 registered quality system.

B. Approved Manufacturer shall be Sika Corporation, Industrial Flooring, 201 Polito Avenue, Lyndhurst, NJ 07071, Phone 201.933.8800, Fax 201.933.6225, www.sikafloorusa.com

2.02 SYSTEM

A. SPECIFIER'S NOTE:

B. Sikafloor ESD Epoxy Conductive Electrostatic Control System consists of Sikafloor 220W Conductive Primer, and Sikafloor 200C ESD. The system is designed to impart electrostatic control properties, in conjunction with ESD footwear, to a variety of substrates, including existing non-conductive substrates. The system provides very low body voltage values (BVG) when used with the appropriate ESD standards. Conforms to ANSI S20.20-2021 (2.5 X 104 to 1.0 X 106 ohms) when tested in accordance with ANSI/ESD S7.1/ASTM F150. Meets Class 0 requirements for ANSI S20.20 electronics applications. Sikafloor 220W Conductive primer and Sikafloor 200C ESD are typically installed on a standard Sikafloor epoxy concrete primer, Sikafloor moisture tolerant primer or Sikafloor PurCem, specifically formulated for self-leveling and structurally reprofiling damp "green" or saturated surface dry concrete slabs with excessive moisture. When installed on existing epoxy coatings, an isolation layer of Sikafloor epoxy coating is required.

C. SPECIFIER'S NOTE: The system thickness is adjustable to 28 – 32 mils depending on condition of use.

D. Resinous flooring system: Sikafloor ESD Conductive Epoxy Conductive Electrostatic Control System consists of Sikafloor 220W Conductive Primer, and Sikafloor 200C ESD. The system is designed to impart electrostatic control properties to a variety of substrates in conjunction with ESD footwear, including existing non-conductive substrates. The system provides very low body voltage values (BVG) when used with the appropriate ESD standards. Typically applied between 28 – 32 mils thick. System to consist of the following components:
   1. Primer: Sikafloor 161 applied between 8 – 10 mils.
   2. Conductive Black Primer: Sikafloor 220W applied between 4 – 6 mils.
   3. Top Coat: Sikafloor 200C ESD applied at 16 mils.

2.03 MATERIALS

A. Primer: Sikafloor 161 is a two part, epoxy resin for priming and leveling mortars with the following properties:
   1. Pull-off Strength (ASTM D4541): ??? 400 psi with 100% concrete failure.
   2. Shore D Hardness (ASTM D2240): 76 at 7 days.
   3. Solid Content: ~ 100% (by volume) / ~ 100% (by weight).
   4. VOC Content (ASTM D2369): ≤ 50 g/L.
   5. Permeability (ASTM E96): 9.0 g/m² (24 hours / +75°F).
   6. Water Absorption (ASTM D570): 0.14 g/h - m2.
   7. Viscosity (approximately) of Components A + B: 775 (SP2/100).

B. Conductive Black Primer: Sikafloor 220W Conductive is a two-component water based epoxy coating with electrostatic conductivity. It is designed for use in combination with Sikafloor 200C ESD. Sikafloor 220W has the following properties:
   1. Pull-off Strength (ASTM D4541): ??? 400 psi with 100% concrete failure.
   2. Solid Content: Approx. 40%
   3. Electrical Resistance: < 10,000 ohms ANSI STM S7.1 @ 10 volts
   4. VOC Content (ASTM D2369): ≤ 50 g/L.

C. Top Coat: Sikafloor 200C ESD is a four-component ESD epoxy coating system designed to impart electrostatic control properties to a variety of substrates in conjunction with ESD footwear, including existing non-conductive substrates in Refer to Sikafloor ESD color chart color with the following properties:
   1. Pull-off Strength (ASTM D4541): ??? 350 psi with 100% concrete failure.
   2. VOC Content (ASTM D2369): ≤ 50 g/L.
   3. Abrasion Resistance (ASTM D4060): 0.01 - 0.02 grams (CS-17 Wheel, 1000 gm load, 1000 cycles).
   4. Gloss (60°): 80 – 90
   5. Viscosity: 300 - 650 cps. at 73° F (23° C).
   6. Flexibility (ASTM D522): 1/4 inch. (0.02 feet.) passes test
   7. Cove base: Epoxy mortar cove based.

EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive flooring system. Notify Architect/General Contractor/Owner/Owner's representative if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected. Do not apply to substrate treatments for moisture, repair, or leveling not of the same Manufacturer.

B. Surface must be clean, sound and dry. Remove dust, laitance, grease, curing compounds bond inhibiting impregnations, waxes and any other contaminants. All projections, rough spots, etc. should be dressed off to achieve a level surface prior to the application.

C. Concrete substrate to have a minimum compressive strength of 3,500 psi at 28 days and a minimum of 215 psi in tension at time of application.

D. Substrate moisture:
   1. Measure and confirm Substrate Moisture Content, Ambient Relative Humidity, Ambient and Surface Temperature and Dew Point.

2. Confirm and record above values at least once every 3 hours during installation, or more frequently whenever conditions change (e.g. Ambient Temperature rise/fall, Relative Humidity increase/decrease, etc.).

E. Ensure concrete substrate conforms to the minimum requirements of the flooring manufacturer.

F. Flooring system shall not be applied to sand-cement setting beds. Sand-cement beds shall be removed to structural concrete substrate and re-leveled/sloped as necessary to achieve grade and/or adequate drainage.

G. Flooring system shall not be applied to asphaltic or bitumen membranes, soft wood, aluminum, copper or fiberglass reinforced polyester/vinyl ester composites.

H. Application to glazed or vitrified brick and tile, structural wood, steel shall only be permitted with Manufacturer's written recommendation.

3.02 SURFACE PREPARATION

A. Prepare surface to receive flooring systems in accordance with manufacturer's written instructions.

B. Remove dirt, oil, grease, wax, laitance, curing compounds, water-soluble concrete hardeners, and other surface contaminants. Remove sealers, finishes, and paints. Remove unsound concrete by appropriate mechanical means.

C. Concrete: Shall be cleaned and prepared to achieve laitance-free and contaminant-free, open textured surface by shot blasting or equivalent mechanical means (CSP level as per ICRI guidelines and manufacturer's written recommendation).

D. Chemical Surface Preparation: Chemical surface preparation (acid etching) is unacceptable and will void Manufacturer's warranty.

E. Control joints and cracks: Provide repair and treatment of control joints and surface cracks utilizing manufacturer's standard materials and installation details.

3.03 APPLICATION

A. Mix and apply material with strict adherence to manufacturer's written installation procedures and coverage rates.

B. Follow Manufacturer's written recommendations on terminations and connections to walls, drains, doorways, columns and floor-to-floor transitions.

C. Do not apply while ambient and substrate temperatures are rising.

D. Apply resinous flooring with care to ensure that no laps, voids, or other marks or irregularities are visible, and with an appearance of uniform color, sheen and texture, all within limitations of materials and areas concerned.

E. Match colors and textures of approved samples.

F. Install cove base ... high with ... radius in accordance with manufacturer's written instructions.

3.04 CLEAN UP

A. Disposal of this product, solution and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements.

B. Empty containers should be taken to an approved waste handling site for recycling or disposal.

3.05 PROTECTION

A. SPECIFIER'S NOTE: Under certain conditions, cure times, recoat times and return to service time may be shortened due to environmental conditions. Consult Manufacturer's Product Data Sheets, and review job site conditions to determine if shorter times can be achieved.

B. Freshly applied material should be protected from dampness, condensation and water for at least 72 hrs.

C. Beware of air flow and changes in air flow. Introduction of dust, debris, and particles, etc. may result in surface imperfections and other defects.

D. Follow manufacturer's written recommendation with respect to cure, wait time and return to service.

END OF SECTION 09 66 28

SECTION 09 67 00
FLUID-APPLIED FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fluid-applied flooring and base.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealing joints between fluid-applied flooring and adjacent construction and fixtures.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems: Grounding and bonding of conductive flooring to building grounding system.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store resin materials in a dry, secure area.

B. Store materials for three days prior to installation in area of installation to achieve temperature stability.

1.05 FIELD CONDITIONS

A. Maintain minimum temperature in storage area of 55 degrees F.

B. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fluid-Applied Flooring:

2.02 FLUID-APPLIED FLOORING SYSTEMS

END OF SECTION 09 67 00

SECTION 09 90 00
PAINTING AND COATING - COMMERCIAL FACILITY GUIDE SPECIFICATION - SHERWIN-WILLIAMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Interior painting and coating systems.

C. Exterior painting and coating systems.

D. Scope:
   1. Finish surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
      a. Exterior:
         1) Metal, Miscellaneous: Iron, ornamental iron, structural iron and steel, ferrous metal.
      b. Interior:
         1) Wood: Walls, ceilings, doors, and trim.
         2) Drywall: Walls, ceilings, gypsum board, and similar items.

1.02 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Product characteristics.
   2. Surface preparation instructions and recommendations.
   3. Primer requirements and finish specification.
   4. Storage and handling requirements and recommendations.
   5. Application methods.
   6. Clean-up information.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Products: Subject to compliance with requirements, provide Sherwin-Williams Company (The) products indicated; www.sherwin-williams.com/#sle.

2.02 PAINTINGS AND COATINGS

A. General:
   1. Provide factory-mixed coatings unless otherwise indicated.
   2. When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application.
   3. Do not reduce, thin, or dilute coatings or add materials to coatings unless specifically indicated in manufacturer's instructions.

B. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

2.03 PAINT SYSTEMS - EXTERIOR

A. Metal, Miscellaneous: Iron, ornamental iron, structural iron and steel, ferrous metal.
   1. Latex Systems:
      a. Semi-Gloss Finish:
         1) 1st Coat: Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series: www.sherwin-williams.com/#sle.
         2) 2nd and 3rd Coat: Sherwin-Williams Pro Industrial Acrylic Semi-Gloss, B66-650 Series: www.sherwin-williams.com/#sle.

2.04 PAINT SYSTEMS - INTERIOR

A. Wood: Walls, ceilings, doors, and trim.
   1. Alkyd Systems, Water Based:

a. Low Sheen Finish:
1) 1st Coat: Sherwin-Williams Premium Wall and Wood Primer, B28W8111: www.sherwin-williams.com/#sle.
2) 2nd and 3rd Coat: Sherwin-Williams Pro Industrial Water Based Alkyd Urethane Enamel Low Sheen, B53-1250 Series: www.sherwin-williams.com/#sle.

B. Drywall: Walls, ceilings, gypsum board, and similar items.
1. Latex Systems:
a. Eg-Shel Finish High Performance (HP):
1) 1st Coat: Sherwin-Williams ProMar 200 Zero VOC Interior Latex Primer, B28W2600: www.sherwin-williams.com/#sle.
2) 2nd and 3rd Coat: Sherwin-Williams ProMar 200 HP Zero VOC Eg-Shel, B20-1950 Series: www.sherwin-williams.com/#sle.
2. Epoxy Systems, Water Based:
a. Semi-Gloss Finish:
1) 1st Coat: Sherwin-Williams ProMar 200 Zero VOC Interior Latex Primer, B28W2600: www.sherwin-williams.com/#sle.
2) 2nd and 3rd Coat: Sherwin-Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy, K46 Series: www.sherwin-williams.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions.

C. Apply coatings at spread rate required to achieve manufacturer's recommended dry film thickness.

3.04 PRIMING

A. Apply primer to all surfaces unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

B. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to top coat manufacturers.

END OF SECTION 09 90 00

SECTION 10 21 13.16
PLASTIC LAMINATE TOILET PARTITIONS

PART 1 - GENERAL

1.01 SCOPE: PROVIDE PLASTIC LAMINATE TOILET PARTITIONS, COMPLETE.

1.02 SUBMITTALS: COMPLY WITH SECTION 01300.

A. Product Data: Submit manufacturer's detailed technical data for materials, fabrication, and installation.

B. Shop Drawings: Submit shop drawings for the fabrication and erection of toilet partition assemblies not fully described by manufacturer's data. Show all anchorages, gauges of laminated plastic, hardware, fittings and fastenings. Submit setting drawings, templates and instructions for the installation of anchorage devices built into other work.

C. Samples: Submit full color range of plastic laminate samples for selection by Architect.

PART 2 - PRODUCTS

2.01 MANUFACTURERS: BOBRICK WASHROOM EQUIPMENT, INC., GLOBAL STEEL PRODUCTS CORP., COLUMBIA PARTITIONS, GENERAL PARTITIONS, OR APPROVED EQUAL.

2.02 TYPE: FLUSH CONSTRUCTION FLOOR MOUNTED OVERHEAD BRACED TYPE PARTITIONS. WIDTH, LENGTH, AND HEIGHT AS INDICATED.

2.03 MATERIALS AND FABRICATION:

A. Laminated Plastic: NEMA Std. LD-3, minimum .050" thick in pattern and color as selected by Architect from manufacturer's standards.

B. Door, Panel, Pilaster Core: High density particleboard or close-grained hardwood-faced plywood. Finished pilasters 1-1/4" thick (1-1/8" core); finished doors and partition panels 1" thick (7/8" core).

C. Sealer: Seal core surfaces exposed by machining for hardware attachment with sealer as recommended by the manufacturer.

D. Adhesive: Urea resin glue for permanent water resistant and heat resistant bonding.

E. Pilaster Shoes: 3" high, 20 gauge type 302/304 polished stainless steel.

F. Stirrup Brackets: Manufacturer's standard design for attaching panels to walls and pilasters of stainless steel or chrome-plated brass to match hardware finish.

G. Hardware and Accessories: Polished stainless steel or chrome-plated brass hardware and accessories, including cutout insert type (not surface mounted) gravity or spring action cam type hinges, latch/keeper, and coat hook.

H. Headrails: Continuous full length headrails, minimum 1" X 1-1/2", or stainless steel, extruded anodized aluminum, or anodized aluminum tubing, set into the top of the pilaster in a reinforced channel.

I. Anchorages and Fasteners: Exposed fasteners or stainless steel, chromium plated steel or brass finished match hardware. Use theft resistant (one way) type heads and nuts for exposed screws. Use hot-dip galvanized, cadmium plated, or other rust resistant protective-coated steel for concealed anchors.

2.04 FABRICATION: FURNISH STANDARD DOORS, PANELS, SCREENS, AND PILASTERS FABRICATED FOR FLOOR MOUNTED AND OVERHEAD BRACED PARTITION SYSTEM. FURNISH UNITS WITH CUTOUTS, DRILLED HOLES, AND INTERNAL REINFORCEMENT TO RECEIVE PARTITION-MOUNTED HARDWARE, ACCESSORIES, AND GRAB BARS, AS SPECIFIED.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Install partitions and doors rigid, straight, plumb and level, in strict accordance with manufacturer's instructions and final shop drawings.

B. Provide uniform clearance of not more than 1/2" between pilasters and walls, and not more than 1" between panels and walls.

C. Secure panels to wall with not less than 2 stirrup brackets attached near top and bottom of panel. Locate wall brackets so that holes for wall anchorages occur in tile joints. Secure panels to pilasters with not less than 2 stirrup brackets located to align with stirrup brackets at wall.

D. Secure panels in position with manufacturer's recommended anchoring devices.

E. Secure pilasters to floor; level, plumb and tighten installation with devices furnished. Secure overhead-brace to each pilaster with not less than two fasteners. Hang doors and adjust so that tops of doors are parallel with overhead-brace when doors are in closed position.

3.02 ADJUST AND CLEAN:

A. Adjust and lubricate hardware for proper operation. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges out-swinging doors to return to fully closed position.

B. Clean exposed surfaces of partition systems using materials and methods recommended by manufacturer, and provide protection as necessary to prevent damage during remainder of construction period.

END OF SECTION 10 21 13.16

SECTION 10 28 00
TOILET ACCESSORIES

PART 1 - GENERAL

1.01 SCOPE: PROVIDE ACCESSORIES, COMPLETE, FOR TOILET ROOMS, JANITOR'S ROOM, AND CLASSROOMS.

1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS:

1.03 UNFRAMED MIRRORS; SECTION 08800 - GLASS AND GLAZING.

1.04 SUBMITTALS:

A. Product Data: Submit technical data and installation instructions for each toilet accessory.

B. Shop Drawings: Submit shop drawings showing grab bar installation. Provide setting drawings, instructions and directions for installation of anchorage devices in other work.

1.05 JOB CONDITIONS: COORDINATE ACCESSORY LOCATIONS WITH OTHER WORK TO AVOID INTERFERENCE AND TO ASSURE PROPER OPERATION AND SERVICING OF ACCESSORY UNITS.

PART 2 - PRODUCTS

2.01 MANUFACTURERS: BOBRICK, BRADLEY, OR ASI OR EQUAL.

2.02 MATERIALS:

A. Stainless Steel: ASI type 302/304, No. 4 finish, 22 gage minimum.

B. Fasteners: Screws, bolts, and other devices of same material as accessory unit, or of galvanized steel where concealed.

2.03 ACCESSORIES: LETTER IN PARENTHESES INDICATES ACCESSORY KEY AS SCHEDULED ON DRAWINGS.

A. Grab Bars (1): B-6206399 Series, Bradley 812-2 Series, or ASI 3200-P; straight bar, 42" long. Strongly secure fastenings to steel backing plate or by other accepted methods to withstand contemplated stress. Submit shop drawings of Anchoring methods.

B. Grab Bars (2): B-6206399 Series, Bradley 812-2 Series, or ASI 3200-P; straight bar, 18" long. Strongly secure fastenings to steel backing plate or by other accepted methods to withstand contemplated stress. Submit shop drawings of Anchoring methods.

C. Grab Bars (3): B-6206399 Series, Bradley 812-2 Series, or ASI 3200-P; straight bar, 36" long. Strongly secure fastenings to steel backing plate or by other accepted methods to withstand contemplated stress. Submit shop drawings of Anchoring methods.

D. Toilet Paper Dispenser, Surface-mounted, Dual Rolls (4): Bobrick B-2741, Bradley 5241, or ASI 0264-1A, without controlled delivery.

E. Soap Dispenser, Wall-mounted (5): Bobrick B-112, Bradley 6542 or ASI 0341.

F. Paper Towel Dispenser and Receptacle Combination Semi-recessed (7): Bobrick B-3949, Bradley 234-10, or ASI 0469-BLSM.

2.04 MIRROR (6): REFER TO SECTION 08800 GLAZING

2.05 MOP/BROOM HOLDER WITH SHELF:

A. .05 thick stainless stee, Type 304, with 1/2 inch retruned edges, .06 inch steel wall brackets

B. Drying Rod: Stainless steel, 3/8 inch diameter

C. Mop/Broom Holders: Cadmium-plated steel spring-loaded rubber cam holders at shelf front.

D. Length; Manufactures;s Standard length for number of holders.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Install toilet accessory units in accordance with manufacturer's instructions, using fasteners which are appropriate to substrate and recommended by manufacturer of unit.

B. At grab bars strongly secure fastenings to steel backing plate or by other accepted methods. Submit shop drawings of anchoring methods.

C. Install units plumb and level, firmly anchored in location and at heights indicated or directed by Owner's representative.

END OF SECTION 10 28 00

SECTION 10 40 00
INTERIOR SIGNAGE

PART 1 – GENERAL

1.01 SCOPE: SIGNAGE, COMPLETE.

A. Work performed and or materials specified under this scope are to meet or exceed the intent and requirements as defined by the prerequisites and credits of the LEED for Schools Reference Guide.
   1. Credit MR 2.1 and 2.2
   2. Credit MR 4.1 and 4.2

B. Packing and waste materials are to be disposed of in compliance with the implemented waste management plan defined by Section 01524 “Construction Waste Management” and LEED Credits MR 2.1 and 2.2.

FURNISH PRODUCT DATA OR MSDS SHEETS FOR MATERIALS HIGHLIGHTING VOC LIMITS.

SUBMITTALS

A. Manufacturers must submit three references showing products for projects completed within the last six years.

B. Submit manufacturer’s technical data and installation for each type of sign.

C. Submit shop drawings listing sign size, letterform and letter heights.

D. Submit one full-size sample sign of type, style and color specified, including method of attachment. If approved, the sample will become part of the job.

SIGN TYPE DESCRIPTION

A. Signage shall consist of room number and room function to meet the requirements of Americans with Disabilities Act 1990 (ADA) and ANSI A117.1-1992.

PART 2 – PRODUCTS

5.01 MANUFACTURER

A. Provide products from Mohawk Sign Systems, Inc., Post Office Box 966, Schenectady, New York 12301-0966 or approved equal. Other manufacturers must submit their signage products to the Architect ten (10) days prior to the bid date for approval to be considered as an equal.

GRAPHIC PROCESS

A. Signage by allowance as stated in Section 01010. Sign schedule will be established with Owner prior to manufacturing.

B. All signs shall be manufactured using Graphic Process Series 200A-Sand carved using Format D.
   1. Tactile characters shall be raised the required 1/32” from sign face. Glue-on letters or etched backgrounds are not acceptable.
   2. All text shall be accompanied by Grade 2 Braille. Braille shall be separated 2” from the corresponding raised characters. Grade 2 Braille translation to be provided by signage manufacturer.
   3. Perimeter borders shall be 3/8”.
   4. All letters, numbers and/or symbols shall contrast with their background, either light characters on a dark background or dark characters on a light background. Characters and background shall have a non-glare finish.

C. Plaque material shall be melamine plastic laminate, approximately 1/8” thick with contrasting core color. The melamine shall be non-static, fire retardant and self-extinguishing. The plastic laminate will be impervious to most acids, alkalis, alcohol, solvents, abrasives and boiling water.

D. Letterform shall be Gill Sans upper case or other San Serif or Simple Serif letterforms.

E. Size of letters and numbers shall be as follows:

F. Room numbers shall be 1”

G. Lettering for room I.D. signs shall be ¾”

H. Symbol size shall be 4”

I. Standard Grade 2 Braille shall be 2” below copy

J. Copy Position: CC (centered/centered) or as indicated on drawings

SIGN SIZE

ROOM FUNCTION SIGNS: 2” X LENGTH AS REQUIRED.

A. Restroom signs shall be design ADA-4 size 8”x8” with a 4” accessibility symbol, gender symbol and the verbal description placed directly below followed by Grade 2 Braille.

B. Corners: 2” radius

C. Allow three (3) room numbers and fifteen (15) characters per room.

MOUNTING

A. Signs shall be mounted using vinyl tape. The signs shall be mounted 60” from the floor to the center of the sign on the latch side. The distance between the doorframe and sign on the latch side should be 2”. Installer/User assumes responsibility for suitable installation of the signs.

END OF SECTION 10 40 00

SECTION 10 43 10
EXTERIOR SIGNAGE

PART 1 – GENERAL

1.01 SUMMARY:

A. This section includes the following:
   1. Panel signs
   2. Dimensional characters (letters and logos) for exterior use. See elevation.
   3. Signage accessories

1.02 SUBMITTALS:

A. Product Data: For each product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, wiring diagrams, and attachments to other work.
   1. Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings.
   2. Provide message list for each sign, including large-scale details of wording and lettering.

C. Samples: For each sign material indicated that involves color selection.

1.03 QUALITY ASSURANCE:

A. Regulatory Requirements: Comply with the Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.

B. 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.

PART 2 – PRODUCTS

2.01 MANUFACTURERS:

A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include, but are not limited to, the manufacturers specified.
   2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.02 PANEL SIGNS

A. General: Provide panel signs that comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.

B. Manufacturers:
   1. Best Manufacturing Co.;
   2. Mohawk Sign Systems;
   3. Signature Signs, Inc.; or approved equal.

C. Cast-Acrylic Sheet: Manufacturer's standard and as follows:
   1. Color: As selected by Architect.

D. Aluminum Sheet and Plate: ASTM B 209 (ASTM B 209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of 5005-H15.

E. Unframed Panel Signs: Fabricate signs with edges mechanically and smoothly finished to comply with the following requirements:
   1. Edge Condition:
   2. Corner Condition: Rounded to radius indicated.

F. Brackets: Fabricate brackets and fittings for bracket-mounted signs from extruded aluminum to suit panel sign construction and mounting conditions indicated. Factory-paint brackets in color matching background color of panel sign.

G. Graphic Content and Style: Provide sign copy that complies with requirements indicated on drawings for size, style, spacing, content, mounting height and location, material, finishes, and colors of signage.

2.03 DIMENSIONAL CHARACTERS

A. Aluminum Castings: Provide aluminum castings of alloy and temper recommended by sign manufacturer for casting process used and for type of use and finish indicated.

B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of 6063-T5.

C. Cast Characters: Form individual letters and numbers by casting. Produce characters with smooth flat faces, sharp corners, and precisely formed lines and profiles, free from pits, scale, sand holes, and other defects. Cast lugs into back of characters and tap to receive threaded mounting studs. Comply with requirements indicated for finish, style and size.
   1. Material: Aluminum

D. Fabricated Characters: Fabricate letters and numbers to required sizes and styles, using metals and thicknesses indicated. Form exposed faces and sides of characters to produce surfaces free from warp and distortion. Include internal bracing for stability and attachment of mounting accessories. Comply with requirements indicated for finish, style and size.
   1. Character Height: 2’-0”
   2. Character Style: As per manufacturer’s trademark

2.04 ACCESSORIES

A. Anchors and Inserts: Provide non-ferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.05 ALUMINUM FINISHES

A. Baked-Enamel Finish: Manufacturer’s standard baked enamel complying with paint manufacturer’s written instructions for cleaning, conversion coating, and painting.
   1. Color: As selected by Architect.

PART 3 – EXECUTION

3.01 INSTALLATION

A. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer’s written instructions.
   1. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.

B. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using methods indicated below:
   1. Shim Plate Mounting: Provide 1/8” thick, concealed aluminum shim plates with pre-drilled and countersunk holes, at locations indicated, and where other mounting methods are not practicable. Attach plate with fasteners and anchors suitable for secure attachment to substrate. Attach panel signs to plate using method specified above.
   2. Mechanical Fasteners: Use non-removable mechanical fasteners placed through pre-drilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.
   3. Where panel signs are scheduled or indicated to be mounted on glass, provide matching plate on opposite side of glass to conceal mounting materials.

C. Bracket-Mounted Units: Provide manufacturer’s standard brackets, fittings, and hardware as appropriate for mounting signs that project at right angles from walls and ceilings. Attach brackets and fittings securely to walls and ceilings with concealed fasteners and anchoring devices to comply with manufacturer’s written instructions.

D. Dimensional Characters: Mount characters using standard fastening methods recommended in writing by manufacturer for character form, type of mounting, wall construction, and condition of

exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.

1. Flush Mounting: Mount characters with backs in contact with wall surface.
2. Projected Mounting: Mount characters at projection distance from wall surface indicated.

END OF SECTION 10 43 10

SECTION 31 10 00
EARTHWORK

PART 1 - GENERAL

1.01 SCOPE: PROVIDE EARTHWORK, COMPLETE, INCLUDING EXCAVATION, PLACEMENT, STABILIZATION, AND COMPACTION OF EARTH. PLACE COMPACTED FILL IN ALL TRENCHES, HOLES AND VOIDS RESULTING FROM THE DEMOLITION OF UTILITIES, FOOTINGS AND FOUNDATIONS, ETC. FINISH GRADE TO A POSITIVE SLOPE TO ASSURE NO STANDING WATER WHEN COMPLETE.

A. Meet requirements for excavation safety, or to facilitate construction due to wet conditions.
   1. Perform excavation regardless of type, nature, or condition of materials encountered.
   2. Contractor shall make his own estimate of the type and extent of the various materials to be excavated in order to accomplish the work.
   3. There will be no extra compensation for dewatering.

1.02 REFERENCES:

1. Arkansas State Highway & Transportation Department, Standard Specifications for Highway Construction, 1993.
   a. AHTD Section 303 – Aggregate Base Course
2. American Society for Testing & Materials, 1916 Race St., Philadelphia, PA 19103
   a. ASTM D 698 – Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb. Rammer and 12” Drop.
   b. ASTM D 1556 – Test Method for Density of Soil in Place by the Sand-Cone Method.
   c. ASTM D 1557 – Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 10 lb Rammer and 18” Drop.
   d. ASTM D 2216 – Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock and Soil-Aggregate Mixtures.
   e. ASTM D 2922 – Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   f. ASTM D 3017 – Test Method for Moisture Content of Soil and Soil-Aggregate in Place of Nuclear Methods (Shallow Depth).
3. Occupational Safety & Health Administration (OSHA) Standard for Excavation of Trenches Safety System, 29 CFR 1926, Subpart P – Excavations.

B. Arkansas Statute 291 of 1993

1.03 DEFINITIONS:

1. Relative Compaction:
   a. The ratio, in percent, of the as-compacted field dry density to the laboratory maximum dry density as determined by the Standard Proctor Test, ASTM D 698, or as determined by the Modified Proctor Test, ASTM D 1557, as applicable.
   b. Corrections for oversize material may be applied to either the as-compacted field dry density or the maximum dry density, as determined by the Design Professional.
2. Optimum Moisture Content:
   a. Moisture content of the material for which the maximum dry density is obtained as determined by ASTM D 698 or D 1557.
   b. Field moisture contents shall be determined on the basis of the fraction passing the ¾” sieve.
3. Completed Course: A course or layer that is ready for the next layer or the next phase of construction.

SECTION 22 07 00

PIPING INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Thermal insulation for mechanical and plumbing piping systems including jackets and accessories.

1.2 RELATED SECTIONS

A. Section 220500 – Common Materials and Methods for Plumbing

B. Section 221100 – Plumbing Piping.

1.3 REFERENCES

A. ASTM B 209 - Aluminum and Aluminum-alloy Sheet and Plate.

B. ASTM C 177 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.

C. ASTM C 195 - Mineral Fiber Thermal Insulation Cement.

D. ASTM C 533 - Calcium Silicate Block and Pipe Thermal Insulation.

E. ASTM C 547 - Mineral Fiber Preformed Pipe Insulation.

F. ASTM C 552 - Cellular Glass Block and Pipe Thermal Insulation.

G. ASTM E 84 - Surface Burning Characteristics of Building Materials.

H. ASTM E 96 - Water Vapor Transmission of Materials.

1.4 SUBMITTALS

A. Include product description, list of materials, and thickness for each service and locations.

B. Include detail drawings of insulation dams.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in piping insulation application with three years' minimum experience.

B. Materials: Composite flame spread/smoke developed rating of 25/50 in accordance with ASTM E 84; includes jackets, adhesives, facing, coatings, and mastics.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesive and insulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Insulation:
1. Armstrong.
2. Certainteed Corporation.
3. Knauf Fiber Glass.
4. Manville Corporation.
5. Owens-Corning Fiberglass Corporation.
6. Pittsburgh Corning.
7. Rubatex.

B. Jackets:
1. Childers.
2. Manville Corporation.
3. Premetco.

2.2 INSULATION

A. Type A: Mineral fiber or fiberglass preformed insulation; ASTM C 547; 'k' value of 0.26 at 75 degrees F; noncombustible.

2.3 JACKETS

A. Interior:
   1. Type A Insulation: Provide factory applied white kraft foil vapor barrier.
   2. Insulate fittings, joints and valves with molded insulation of like material and thickness as adjoining pipe. Use insulating cement to fill voids and cracks. Finish with glass or canvas cloth and finish coat. PVC jackets may be used with glass cloth and finish coat.

B. Jacket Materials:
   1. Factory Applied Jackets: White kraft bonded to reinforced foil vapor barrier with self-sealing adhesive joints.

2.4 ACCESSORIES

A. Insulation Bands: 3/4-inch wide; 0.015-inch thick galvanized steel, stainless steel or 0.007-inch thick aluminum.

B. Metal Jacket Bands: 3/8-inch wide; 0.015-inch thick aluminum or 0.010-inch thick stainless steel to match jacket.

C. Insulating Cement: ASTM C 195; hydraulic setting mineral wool; Ryder One-Coat.

D. Sealants: Used at valves, fittings and where insulation is terminated. Sealant is brush applied to end of insulation and continued along pipe surface. Provide Childers CP-76.

E. Adhesives: Used to adhere the longitudinal lap seam of vapor barrier jackets and at butt joints between insulation or fitting covers. Provide Childers CP-82 as general purpose adhesive. Use Childers CP-97 fibrous adhesive for calcium silicate or when adhering pipe saddles and shields to the insulation.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean surfaces to be insulated and install insulation material after performance tests for piping have been completed and approved.

3.2 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Continue insulation with vapor barrier through penetrations.

C. In exposed piping, locate insulation and cover seams in least visible locations.

D. Insulate fittings, valves, flanges and strainers. On flexible connections, expansion joints and unions, bevel and seal ends of insulation and continue sealant a minimum of 4 inches along the piping.

E. On insulated piping conveying fluids between 100 degrees F and 140 degrees F, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation at such locations. Continue sealant a minimum of 4 inches along the piping.

F. Provide dams in insulation at intervals not to exceed 20 feet to prevent migration of condensation or leakage.

G. Provide an insert, except where pipe covering protection saddles are specified, not less than 12 inches long, of same thickness and contour as adjoining insulation, between support shield and piping, but under the finish jacket, on piping 2-1/2 inch diameter or larger, to prevent insulation from sagging at support points. Provide inserts for 180-degree arc and not less than the length of the pipe shield manufactured of cork, cellular glass or other heavy density insulating material suitable for the planned temperature range. Factory fabricated inserts may be used. Adhere pipe shield to insulation with adhesive.

H. Neatly finish and seal all insulation at supports, protrusions and interruptions. Maintain water vapor retarder with mastic.

3.3 SCHEDULE

Piping	Type	Pipe Size	Insulation Thickness
Domestic Cold Water, Hot Water, Tempered Domestic Water, and Hot Water Return Piping.	A	1-1/2" & Smaller	1"
		2" to 4"	1-1/2"
		5" & Larger	2"

END OF SECTION

SECTION 22 11 00

PLUMBING PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Sanitary drainage and vent piping systems and domestic water piping, including valves and fittings.

B. Miscellaneous apparatus attached to plumbing piping systems.

1.2 RELATED SECTIONS

A. Section 220500 – Common Materials and Methods for Plumbing

1.3 REFERENCES

A. ASME A112.26.1M - Water Hammer Arresters.

B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

D. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DMV.

E. ASTM D2665 Poly Vinyl Chloride (PVC) Plastic Drain, Waste and Vent Pipe and Fittings

F. ASTM D2729 Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings

G. ASSE 1011 - Hose Connection Vacuum Breakers.

H. ASSE 1013 - Backflow Preventers, Reduced Pressure Principle.

I. ASSE 1019 - Wall Hydrants, Frost-Proof Automatic Draining Anti-Backflow Types.

J. ASTM B 32 - Solder Metal.

K. ASTM B 88 - Seamless Copper Water Tube.

L. MSS SP-110 - Ball Valves, Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

1.4 SUBMITTALS

A. Include data on pipe materials, pipe fittings, and special fabricated items.

B. Include component sizes, rough-in requirements, service sizes and finishes for specialties.

C. Provide operation and maintenance manual.

1.5 QUALITY ASSURANCE

A. For each product specified, provide components by same manufacturer throughout project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Valves: Apollo, Crane, De Zurik, Nibco, Stockham.

B. Floor Drains: Jay R. Smith, Josam, Tyler/Wade, Zurn.

C. Cleanouts: Jay R. Smith, Josam, Tyler/Wade, Zurn.

D. Water Hammer Arresters: Precision Plumbing Products, Watts, Tyler/Wade.

E. Hose Bibbs/Hydrants: Chicago, Tyler/Wade, Josam, Woodford, Zurn.

2.2 SANITARY SEWER AND VENT PIPING

A. Below Grade Within 5 Feet of Building:
1. PVC plastic pipe, Schedule 40, Class 12454-B (PVC 1120), ASTM D1785; PVC plastic drain, waste and vent pipe and fittings, ASTM D2665; socket fitting patterns, ASTM D3311; primer, ASTM F656; solvent cement, ASTM D2564.

B. Above Grade:
1. PVC plastic pipe, Schedule 40, Class 12454-B (PVC 1120), ASTM D1785; PVC plastic drain, waste and vent pipe and fittings, ASTM D2665; socket fitting patterns, ASTM D3311; primer, ASTM F656; solvent cement, ASTM D2564.

2.3 WATER PIPING

A. Below Grade Within 5 Feet of Building:
1. Pipe 2 Inches and Smaller; Copper Tubing: ASTM B 88, Type K, annealed.
a. Fittings: None.
b. Joints: AWS A5.8 BCuP silver braze (lead free).

B. Above Grade:
1. Pipe 2-1/2 Inches and Smaller; Copper Tubing: ASTM B 88, Type L, hard drawn.

a. Fittings: ASME B16.18, cast bronze, or ASME B16.22 wrought copper and bronze.
b. Joints: ASTM B 32, solder, Grade 95TA (lead free).

2. Pipe Over 2-1/2 Inches
a. Copper Tubing: ASTM B 88, Type K, hard drawn.
1) Fittings: ASME B16.18, cast bronze or ASME B16.22, wrought copper and bronze.
2) Joints: AWS A5.8 BCuP silver braze (lead free).

2.4 VALVES

A. Ball Valves:
1. 2 Inches and Smaller: Bronze body, full port, chrome plated brass/bronze ball, teflon seats, separate packnut with adjustable stem packing, rated 150 pounds per square inch steam and 600 WOG, solder or threaded ends. Valve ends shall have full depth ANSI threads or extended solder connections and be comply with MSS SP-110. Provide with balancing stops on hot water return line.
2. Over 2 Inches: Cast steel body, Class 150 stainless steel ball and stem, teflon seat and stuffing box seals, lever handle, flanged ends.

2.5 DRAINS

A. Refer to fixture schedule.

2.6 CLEANOUTS

A. Interior Service Floor Areas and Exterior Areas: Round coated cast iron floor cleanout with internal gasketed ABS cleanout plug and adjustable ABS housing with scoriated secured round satin nickel-bronze top. Provide satin finish bronze top.

B. Interior Finishes Floor Areas: Square coated cast iron floor cleanout with internal gasketed ABS cleanout plug and adjustable ABS housing with secured scoriated square satin nickel-bronze top. Provide satin finish bronze top, secured vandal proof cover screws, clamp ring and flange.

C. Interior Finished Wall Areas: Round stainless steel wall access cover with center screw, coated cast iron cleanout tee with hub and spigot connection and recessed bronze tapped plug. Provide secured cover vandal proof screw.

2.7 BACKFLOW PREVENTERS

A. Reduced Pressure Backflow Preventer Assembly (High Hazard Applications): ASSE 1013, USC FCCC HR, and CSA B64.5.
1. 3/4-inch to 2-inch: Bronze body, modular design with replaceable seats, two independent check valves with intermediate relief valve, ball valve test cocks, 1/4-turn full port resilient seated bronze ball valves, bronze strainer, soft seated check valve; Watts No. 909QT with 601 check.
2. 2-1/2 inch to 10-inch: Iron body, removable bronze seats, two independent check valves with intermediate relief valve, external sensing

line, stainless steel internal parts, cast iron check valve bodies, 125 lb. cast iron strainer, and nonrising stem gate valve shutoffs; Watts No. 909S.

2.8 ESCUTCHEONS

A. Provide escutcheons at finished surfaces where bare or insulated piping exposed to view passes through floors, walls or ceilings, except in boiler, utility or equipment rooms. Fasten securely to pipe or pipe covering. Provide satin finish, corrosion resisting steel, polished chromium-plated zinc alloy or polished chromium-plated copper alloy of the one-piece or split-pattern held in place by internal spring tension or setscrew.

2.9 WATER HAMMER ARRESTERS

A. ASME A112.26.1M; sized in accordance with PDI WH-201, factory precharged suitable for operation in temperature range of minus 33 to 300 degrees F and maximum 250 pounds per square inch-gage working pressure.

2.10 HOSE BIBBS/HYDRANTS

A. Hose Bibb: Chrome plated brass construction with hose thread spout, adjustable packing nut with deep stem guard, with vacuum breaker in accordance with ASSE 1011.

B. Wall Hydrants (WH-A): ASSE 1019; concealed type, non-freeze, self-draining type with chrome plated brass casting, lockable recessed box, hose thread spout, stainless steel operating stem, removable key and vacuum breaker; Woodford Model No. B65.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

D. Coordinate forming of floor construction to receive drains to required invert elevations.

3.2 INSTALLATION

A. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

B. Route piping in orderly manner and maintain gradient.

C. Install piping to conserve building space and not interfere with use of space.

D. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Provide clearance for installation of insulation and access to valves.

G. Provide access where valves and fittings are not exposed.

H. Establish elevations of buried piping outside the building to be below "frost line," but not less than 18 inches.

I. Establish invert elevations, slopes for drainage to 1/8-inch per foot (nominally 1 percent) minimum, as shown on Drawings. Maintain gradients.

J. Excavate and backfill in accordance with the mechanical general provisions.

K. Install hub and plain end pipe with hub end upstream.

L. Install valves with stems upright or horizontal, not inverted.

M. Use grooved mechanical couplings and fasteners only in accessible locations.

N. Install unions downstream of valves and at equipment or apparatus connections.

O. Install brass male adapters each side of valves in copper pipe system. Sweat solder adapters to pipe.

P. Install ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.

Q. Install ball or butterfly valves for throttling, bypass, or manual flow control services.

R. Install piping parallel with or at right angles to walls unless otherwise shown on drawings.

S. Conceal piping above ceiling, in walls or chases, etc., unless otherwise noted on the drawings.

T. Bending of rigid piping is not permitted, only ells shall be utilized for a change in direction.

U. Temporarily plug or cap open ends of pipe at the end of each work day.

END OF SECTION

SECTION 23 05 00

COMMON METHODS AND MATERIAL FOR HVAC

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Except as modified in this section, General Conditions, Supplementary Conditions, applicable provisions of Division 1, General Requirements, and other provisions and requirements of the Contract Documents apply to work of Division 23.

B. Each section included in Division 23 - Mechanical is incomplete without the provisions stated herein.

1.2 CODES

A. Arkansas Fire Prevention Code, Current Edition, Volumes I, 2, and 3 (based on the International Fire and Building Codes with state amendments)

B. Arkansas State Mechanical Code

C. Arkansas Energy Code

1.3 REFERENCES

A. ASTM D 698 - Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft. (600kN-m/cu. m.)).

B. ASTM E 814 - Fire Tests of Through-Penetration Fire Stops.

C. ANSI/IEEE C2 - National Electrical Safety Code.

D. UL 1479 - Fire Tests of Through-Penetration Firestops.

1.4 DEFINITIONS

A. Provide: Where the word "provide" is used, the word shall be understood to mean "the Contractor shall furnish and install" the equipment, tests, inspections, etc. referenced.

B. Related Work: The sections referenced under RELATED SECTIONS shall be understood to include provisions that directly affect the work being specified in the section where RELATED SECTIONS occurs.

C. Concealed: Where the word "concealed" is used in conjunction with piping, equipment, and the like, the word shall be understood to mean hidden from sight as in chases, furred spaces, or suspended ceilings.

D. Exposed: Where the word "exposed" is used, the word shall be understood to mean open to view.

1.5 CONTRACT DRAWINGS

A. Drawings are generally diagrammatic and are intended to encompass a system that will not interfere with the structural and architectural design of the building. Coordinate work to avoid interferences between piping, equipment, architectural, and structural work.

B. Coordinate with architectural features, trim and millwork details, and install equipment in cabinets or other special areas as directed by A/E.

1.6 PROJECT/SITE CONDITIONS

A. Site Visitation: Visit the site of the proposed construction to become thoroughly familiar with details of work and working conditions, verify dimensions in the field, and advise A/E of discrepancies before performing Work.

B. Space Requirements:
1. Consider space limitations imposed by contiguous work in location of equipment and material. Do not provide equipment or material that is not suitable in this respect.
2. Make changes in equipment location of up to 5 feet, to allow for field conditions prior to actual installation, and as directed by the A/E.

C. Conceal piping and ductwork in finished areas, except in mechanical rooms, and where noted otherwise on the drawings. Route pipes and ducts through the building without interfering with other contractors' equipment or construction.
1. Provide maximum possible clear height underneath piping and ductwork.
2. Install equipment requiring service so that it is easily accessible.
3. Compare the equipment sizes with the space allotted for installation before installation and make written notice of possible conflict. Disassemble large equipment to permit installation through normal room openings when required. Should written notice not be made in a timely manner, make adjustments and modifications necessary without additional compensation.
4. Timely place equipment too large to fit through finished openings and stairways.

D. Site Obstructions:
1. Drawings indicate certain information pertaining to surface and subsurface obstructions that has been taken from available drawings. Such information is not guaranteed as to accuracy of location or completeness of information.
2. Verify with A/E, utility companies, municipalities, and other interested parties that available information has been provided before cutting or trenching operations are begun. Verify locations given.
3. Alter routing of new work should obstruction be encountered, whether or not shown on Drawings. Reroute existing lines, remove obstruction where permitted, or otherwise perform whatever work is necessary to

satisfy the purpose of the new work and leave existing services and structures in a satisfactory and serviceable condition.

4. Assume total responsibility for and repair damage to existing utilities caused by construction, whether or not such existing facilities are shown. Repair the lines, if damaged.

E. Cutting and Patching:

1. Submit written request to A/E in advance of cutting or alterations.
2. Execute cutting and demolition by methods that will prevent damages to other work and will provide proper surfaces to receive installation of repairs.
3. Restore work which has been cut or removed; install new products complying with specified products, functions, tolerances, and finishes specified.
4. Fit work airtight to pipes, sleeves, ducts, and other penetrations through surfaces. For fire-rated penetrations, provide assemblies in accordance with UL 1479 and ASTM E 814 utilizing products and materials equal to rating of surfaces penetrated.

1.7 MATERIALS AND WORKMANSHIP

A. Provide new materials and equipment by those regularly engaged in the production and manufacture of specified materials and equipment. Where UL or other agency has established standards for materials, provide materials which are listed and labeled accordingly. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper functioning of the work.

B. Work shall be performed by workmen skilled in the trade required for the work. Install materials and equipment to present a neat appearance when completed in accordance with the approved recommendations of the manufacturer and in accordance with Contract Documents.

C. Provide labor, materials, apparatus, and appliances essential to the complete functioning of the systems described or indicated herein, or which may be reasonably implied as essential whether mentioned in the Contract Documents or not.

D. Make written request for supplementary instructions to A/E in cases of doubt as to Work intended or in the event of need for explanation thereof.

E. Performance and material requirements scheduled or specified are minimum standards acceptable. The right to judge the quality of equipment that deviates from the Contract Documents remains solely with A/E.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Follow the manufacturer's directions completely in the delivery, storage, and handling of equipment and materials.

B. Store equipment in a clean, dry place protected from other construction. While stored maintain factory wrapping or tightly cover and protect equipment against dirt, water, construction debris, chemical, physical or weather damage, traffic and theft.

C. Adequately brace and package equipment to prevent breakage and distortion while in transit.

1.9 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Provide malleable iron, adjustable swivel, split ring.

B. Hangers for Pipe Sizes 2 to 4 Inches and Cold Pipe Sizes 6 Inches and Over: Carbon steel, adjustable, clevis.

C. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron roll.

D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods; cast iron roll and stand for hot pipe sizes 6 inches and over.

E. Vertical Support: Steel riser clamp.

F. Floor Support for Pipe Sizes to 4 Inches and All Cold Pipe Sizes: Cast iron adjustable pipe saddle, locknut nipple, floor flange, and concrete pier or steel support.

G. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

H. Design hangers without disengagement of supported pipe.

I. Copper Pipe Support and Hangers: Carbon steel ring, adjustable, copper plated.

J. Shield for Insulated Piping 2 Inches and Smaller: 18 gage galvanized steel shield over insulation in 180-degree segments, minimum 12 inches long at pipe support.

K. Shield for Insulated Piping 2-1/2 Inch and Larger (Except Cold Water Piping): Use pipe covering protective saddles.

L. Shields for Insulated Cold Water Piping 2-1/2 Inch and Larger: Galvanized steel shields in 180-degree segments in accordance with following table:

Pipe	Metal Gage	Shield Length
2 1/2" to 5"	16	12"
6" to 12"	14	24"
Over 12"	12	24"

M. Shields for Vertical Copper Pipe Risers: Sheet lead.

1.10 INSERTS

A. Provide 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.

1.11 FLASHING

A. Metal Flashing: 26 gage galvanized steel.

B. Lead Flashing: 5 pounds per square foot sheet lead for waterproofing; 1 pound per square foot sheet lead for soundproofing.

C. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.

D. Caps: Steel, 22 gage minimum; use 16 gage at fire resistant elements.

1.12 SLEEVES

A. Sleeves for Pipes Through Non-fire Rated Floors: Form with 16 gage galvanized steel.

B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Above Grade: Form with 18 gage galvanized steel.

C. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing: Provide prefabricated fire rated sleeves including seals, UL listed; or provide Schedule 40 galvanized steel, sized for minimum 1 inch space between sleeve and carrier pipe.

D. Sleeves for Pipes Through Floor Supporting Riser Piping: Standard weight galvanized steel pipe.

E. Sleeves for Pipes Through Roof: Standard weight galvanized steel pipe.

F. Sleeves for Round Ductwork: Form with galvanized steel.

G. Sleeves for Rectangular Ductwork: Form with galvanized steel or wood.

H. Provide fire-stop compound at all penetrations of floor slabs or firewalls such that fire rating integrity of barrier is not lessened.

I. Caulk: Caulk all sleeves water and airtight.

J. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping. Provide pipe sleeves one size larger than the pipe it serves, including insulation, except where "Link Seal" casing seals are used.

K. Sleeves Penetrating Walls Below Grade: Standard weight black steel pipe with 1/4-inch thick steel plate secured to pipe with continuous fillet weld. Provide plate that is 4 inches wider all around than the sleeve it encircles. Hot dip galvanize entire sleeve assembly after fabrication.

1.13 ANCHOR BOLTS

A. Provide galvanized anchor bolts for equipment placed on concrete pads or on concrete slabs, of size and number recommended by manufacturer of equipment.

1.14 FASTENERS

A. Adhesive Anchoring System for Pipe Supported from Existing Solid Base Material:
   1. Anchor Rods: ASTM A 193, Grade B7, Type 2, threaded both ends.
   2. Injection Adhesive: Hilti, Inc., “HIT HY 150".

Anchor Diameter	Embedment Depth	Tension (pounds)	Shear (pounds)
3/8-inch	1-3/4 inches	596	872
3/8-inch	3-1/2 inches	976	872
1/2-inch	2-1/8 inches	780	1548
1/2-inch	4-1/4 inches	968	1548
5/8-inch	2-1/2 inches	960	1984
5/8-inch	3-3/8 inches	1408	2420

B. Expansion Anchoring System for Pipe Supported from Existing Solid Base Material:
   1. Expansion Anchors: CID A-A-1923, Type 4, stud type, zinc plated in accordance with ASTM B 633.
   2. Product: Hilti, Inc., “Kwik Bolt II Expansion Anchor”.

Anchor Diameter	Embedment Depth	Tension 2,000 psi (pounds)	Shear 2,000 psi (pounds)
1/4-inch	1-1/8 inches	180	320
1/4-inch	Greater than or equal to 2 inches	260	400
3/8-inch	1-5/8 inches	340	620
3/8-inch	Greater than or equal to 2-1/2 inches	500	1100
1/2-inch	2-1/4 inches	580	1120
1/2-inch	Greater than or equal to 3-1/2 inches	880	1840
5/8-inch	2-3/4 inches	900	2000
5/8-inch	Greater than or equal to 4 inches	1320	2840
3/4-inch	3-1/4 inches	1260	2600

Anchor Diameter	Embedment Depth	Tension 2,000 psi (pounds)	Shear 2,000 psi (pounds)
3/4-inch	Greater than or equal to 4-3/4 inches	1760	3760

1.15 WELDING

A. Weld piping and above grade steel tanks in accordance with qualified procedures using performance qualified welders and welding operators. Qualified procedures and welders in accordance with ASME Section IX. Welding procedures qualified by others and welders and welding operators qualified by another employer may be accepted as permitted by ANSI B31.1. Notify the A/E 24 hours in advance of tests, and perform the tests at the work site if practicable. Furnish A/E with a copy of qualified procedures and a list of names and identification symbols of qualified welders and welding operators. Apply welders or welding operators assigned symbols near each weld they make as permanent record.

1.16 PAINTING

A. Properly prepare surfaces to receive paint. Prime prepared surfaces and finish with two coats of exterior oil base paint. Verify primer and paint are rated for application.

B. Repair damage to factory painted finishes.

C. Remove splattered and incidental paint from mechanical equipment.

1.17 ACCESS DOORS

A. Provide access doors in walls, floors, and ceilings to permit access to equipment and piping requiring service or adjustment:
   1. Valves.
   2. Manual balance dampers and automatic control dampers.
   3. Fire dampers, smoke dampers and smoke/fire dampers.
   4. Air terminal units.
   5. Duct mounted filters and coils.
   6. Plumbing drainage cleanouts.
   7. Kitchen hood exhaust ductwork, in accordance with NFPA requirements.
   8. Other mechanical equipment indicated in mechanical equipment schedules requiring maintenance, adjustment, or operation.

B. Provide hinged access doors and frames as follows:
   1. Drywall Construction:
      a. Provide with concealed spring hinges and flush screwdriver operated cam locks in sufficient number of the size of the panel. Factory prime paint surfaces not galvanized.
      b. Product: Milcor, "Style DW".
   2. Visible Masonry and Ceramic Tile: Milcor, "Style M".
   3. Gypsum and Cement Plaster: Milcor, "Style K".

4. Acoustic Plaster:
   a. Reinforce panel as required to prevent sagging. Provide continuous steel piano type hinge for the length of the panel, and sleeved and grommeted screwdriver operated cam locks in sufficient number for the size of the panel. Factory prime paint surfaces not galvanized.
   b. Product: Milcor, "Style AP".
   c. Acoustic Tile: Milcor, "Style AT".

C. Provide continuous concealed hinges and cam locks.

D. Provide UL listed 1-1/2 hour Label "B" access doors with automatic self-closing latching mechanism where required.

E. Provide removable ceiling access tile section immediately adjacent to each mechanical or electrical device located in the ceiling plenum above removable tile ceiling.

F. Coordinate approval and location of access doors with A/E.

1.18 NOISE AND VIBRATION

A. Provide the entire operating system and its component items of equipment free of objectionable vibration or noises. Refer to ASHRAE handbook for recommended noise criteria (NC) unless otherwise noted. Statically and dynamically balance rotating equipment, and mount or fasten so that no equipment vibration will be transmitted to the building. If objectionable noise or vibration is produced or transmitted to or through the building structure by equipment, piping, ducts, or other parts of work, rectify such conditions at no additional compensation.

1.19 OPERATING INSTRUCTIONS

A. Provide services of authorized representatives of manufacturer to ensure that the equipment is installed according to the manufacturer's recommendations, is operating properly, and to instruct Owner's operating personnel during start-up and operating tests of complete mechanical systems. Prove operation of equipment to A/E. Notify A/E seven days prior to beginning equipment start-up.

B. Certify in writing that these services have been performed.

1.20 SERVICE

A. Inspect, clean, and service air filters and strainers immediately prior to final acceptance of project. Replace disposable type air filters.

B. Provide lubrication for operation of equipment until final acceptance of the equipment by A/E. Protect bearings during installation and thoroughly grease steel shafts to prevent corrosion. Provide extended lubrication lines for parts requiring lubrication that are concealed or inaccessible.

C. Provide complete and working charge of proper refrigerant, free of contaminants, into each refrigerant system. After each system has been in operation long enough to ensure completely balanced conditions, check the charge and modify it for proper operation as required.

D. Provide protective guard for belts, pulleys, gears, couplings, projecting set screws, keys, and other rotating parts which are located so a person might come in close proximity with. Construct protective guard around angle iron frame, securely bolted to apparatus; comply with safety requirements. Install guard to completely enclose drives and pulleys, and not interfere with lubrication of equipment. Provide 2-inch minimum diameter opening in fan belt guards housing for tachometer.

E. Place mechanical systems in complete working order, and clean and polish fixtures, equipment, and materials thoroughly returning to "as new" condition prior to request for final review.

F. Remove excess material and debris. Clean out lines and fittings and adjust valves. Broom clean areas. Thoroughly clean ductwork inside and out before grilles are installed.

1.21 PROJECT RECORD DOCUMENTS

A. Maintain a set of Contract Documents at the job site for the purpose of recording final size, location, and interrelation of work under this Division. Mark this set of drawings as the job progresses to indicate "as-built" location of equipment, including concealed piping, valves, and ductwork.

B. Clearly and accurately delineate work by dimensions on record drawings as installed, with equipment locations identified by at least two dimensions to permanent structures.

C. Provide certified final record drawings, marked "AS-BUILT," and signed and dated by Contractor at conclusion of project.

1.22 FINAL REVIEW

A. Obtain necessary Certificates of Occupancy from local authorities.

B. Submit final approved operation and maintenance manuals including approved submittals, test reports, and "AS-BUILT" drawings prior to requesting final payment. Delivery of operation and maintenance manuals is a condition of final acceptance.

1.23 GUARANTEE

A. Guarantee materials, parts, and labor for Work for one year from the date of issuance of occupancy permit. During that period, make good faults or imperfections that may arise due to defects or omissions in materials or workmanship with no additional compensation and as directed by A/E.

B. Certain items of equipment, such as small sealed refrigeration units, are covered by the manufacturer's warranty of longer durations.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as follows:

Pipe Size	Max. Hanger Spacing	Hanger Diameter
1/2" to 1-1/4"	6'-6"	3/8"
1-1/2" to 2"	10'-0"	3/8"
2-1/2" to 3"	10'-0"	1/2"
4" to 6"	10'-0"	5/8"
8" to 12"	14'-0"	7/8"
14" and Over	14'-0"	1"
PVC (All Sizes)	6'-0"	3/8"
C.I. Bell and Spigot (or No-Hub)	5'-0" and at Joints	

B. Install hangers to provide minimum 1/2-inch space between finished covering and adjacent work.

C. Place a hanger within 12 inches of each horizontal elbow.

D. Use hangers with 1-1/2 inch minimum vertical adjustment.

E. Support horizontal cast iron pipe adjacent to each hub, with 5-foot maximum spacing between hangers.

F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

H. Support riser piping independently of connected horizontal piping.

I. Provide corrosion resistant hangers for piping hangers in corrosive areas. Provide hanger rods, bolts, nuts, and metal parts coated with same material as hangers.

3.2 INSERTS

A. Provide inserts for placement in concrete formwork.

B. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

D. Where concrete slabs form finished ceiling, provide inserts flush with slab surface.

E. Where inserts are omitted, drill through concrete slab from below and provide thru-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

3.3 FLASHING

A. Provide flexible flashing and metal counterflashing where sleeves, piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

B. Flash vent and soil pipes projecting 3 inches minimum above finished roof surface with lead worked 1-inch minimum into hub, 8 inches minimum clear on sides with 24-inch by 24-inch sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counterflash and seal.

C. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36-inch by 36-inch sheet size. Fasten flashing to drain clamp device.

D. Seal floor drains watertight to adjacent materials.

E. Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms, installed in accordance with manufacturer's instructions for sound control.

F. Flexible sheet flash and counterflash curbs for mechanical equipment on roof with sheet metal; seal watertight.

3.4 EQUIPMENT BASES AND SUPPORTS

A. Coordinate installation of equipment bases of concrete type specified under Division 3 for outdoor equipment on grade and floor mounted equipment as indicated on Drawings.

B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct support of steel members. Brace and fasten with flanges bolted to structure.

D. Provide rigid anchors for pipes after vibration isolation components are installed.

E. Provide base of a minimum height of 4 inches above finished grade and a width that projects a minimum of 3 inches beyond equipment on all sides. Bevel edges of base.

F. Prepare surface under bases by cleaning, clearing, chipping and roughing.

G. Provide curbs of 14 inches minimum height above roofing surface for installation of mechanical equipment on roof.

3.5 SLEEVES

A. Provide sleeves for all pipe penetrations through walls, roof or slab above grade.

B. Set sleeves in position in formwork. Provide reinforcing around sleeves.

C. Extend sleeves through floors 2 inches above finished floor level. Caulk sleeves full depth and provide floor plate.

D. Where piping or ductwork penetrates floor, ceiling or wall, close off space between pipe or duct and adjacent work with fire stopping insulation and seal airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration. When penetration is through a fire rated floor or wall, provide fire safing insulation so that the assembly when complete is UL listed and equals the fire rating of construction penetrated by the sleeve.

E. Install chrome plated steel escutcheons at finished surfaces.

F. Provide three 6 inch long reinforcing rods welded at 120-degree spacing to the sleeve on all sleeves supporting riser piping 4 inches and larger. Embed reinforcing rods in concrete or grout to existing concrete.

G. Install sleeve assembly for walls below grade with 1/4-inch thick plate located in the middle of the wall.

H. Neatly cut holes in existing walls, floors and roofs for placement of sleeves. Place sleeve and grout, and caulk annular space to provide finished appearance.

I. Install pipe in sleeve so that neither the pipe nor its insulation touches the sleeve at any point.

J. Seal space between pipe and sleeve watertight for all sleeves penetrating the roof.

3.6 ANCHOR BOLTS

A. Locate position of anchor bolts by means of suitable templates.

B. When equipment is placed on vibration isolators, secure equipment to the isolator and the isolator to the floor, pad or support as recommended by the vibration isolator manufacturer.

3.7 INSULATION SHIELDS

A. Provide insulation shields at every hanger support.

B. Provide shields of the proper length to distribute weight evenly and to prevent sagging or indentation of insulation at hanger.

C. Install shield so that hanger is placed at the center of the shield.

D. Attach shield to insulation with adhesive to prevent slippage or movement.

END OF SECTION

SECTION 23 05 94

BALANCING OF SYSTEMS

PART 1 GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

A. Systems Cleaning, Pressure and Operational Testing: Section 230593.

1.02 SUBMITTALS

A. Quality Control Submittals:
1. Testing, Adjustment and Balancing Reports:
a. Hydronic Systems: Submit results on Form BDC-374, which can be obtained from the Director's Representative or use a similar test report form which includes all of the items and data included on Form BDC-374.
b. Air Systems: Submit results on Forms BDC-340 and 341 which can be obtained from the Director's Representative, or use similar test report forms, which includes all the items and data included on Forms BDC-340 and 341.
c. Submit final testing and balancing results on applicable report forms, as approved or furnished by the environmental systems balancing council or bureau, which is certifying the independent member agency performing the Work, required by this Section. Each final systems report form shall bear the signature of the person performing the Work and recording the data and the signature of the certified supervisor for the performing agency. Submit simultaneously with the final reports, a list of the instruments used with the last date of calibration for each instrument.

1.03 QUALITY ASSURANCE

A. Qualifications:
1. Provide the services of a certified independent agency for the testing, adjustment and balancing of all air distribution and hydronic distribution systems complete with all connected apparatus and equipment. The agency shall be certified by the Associated Air Balance Council Bureau - AABC, Los Angeles, Cal. 90026 or by National Environmental Balancing Bureau - NEBB, Arlington, Va. 22209.
2. The Work shall be performed by skilled mechanical technicians under the direct supervision of certified personnel in the employ of the independent agency. The supervisor shall be personally certified by the national council or bureau, as approved by the Director.

1.04 SEQUENCING AND SCHEDULING

A. Scheduling:
   1. Perform environmental systems testing and balancing after cleaning, miscellaneous testing, adjustment and operational testing Work has been completed.
   2. Test and balance system during a period of time when outside temperature conditions will impose a significant load on the system; i.e., summer months for air conditioning system, winter months for heating system. Balance and adjust systems accordingly.
   3. Send written notification to the Director a minimum of five days prior to the performance of testing and balancing Work. Perform testing and balancing Work in the presence of the Director's Representative.

PART 2 PRODUCTS

2.01 TEST EQUIPMENT

A. General Information: Test instruments are included in this specification for information only. Balancing of air and hydronic systems shall be performed by qualified personnel utilizing company owned test instruments, which will remain the property of the company. Use test instruments which are in first class operating condition, with individual calibration histories to guarantee their accuracy. Test instruments shall be of type and kind as required by the type of system installed. Trade names and manufacturer's names are mentioned in this section for descriptive purposes only; instruments of equivalent range and capabilities may be utilized.

B. Air Balancing Instruments:
   1. Manometers: Inclined with ranges of 0 to 1/4 inch and 0 to 1 inch; Combination inclined and vertical with a range of 0 to 5 inches and U tube type, 18 inches.
   2. Portable "Magnehelic" Draft Gages: Ranges 0 to 1/2 inch, 0 to 1 inch and 0 to 5 inches.
   3. Anemometers: Deflecting vane type with a range of 100 to 3000 fpm, similar to Alnor Velometer Model 6000 BP and 4 inches diameter rotating vane type.
   4. Pitot Tubes: ASHRAE standard type, stainless steel, 5/16 inch diameter, lengths as required.
   5. Sling Psychrometer.
   6. Smoke Candles and Smoke Generator.

C. Hydronic Balancing Instruments:
   1. Calibrated Test Gages: Ranges 0 to 30 lbs., 0 to 60 lbs., 0 to 200 lbs.
   2. Calibrated Test Gages (Compound Type): Ranges from -30 inches to 30 lbs. and -30 inches to 60 lbs.

3. U Tube Manometer: 36 inches.

D. Air and Hydronic Systems Balancing Instruments:
1. Thermometers: 12 inches mercury column type and dial type, with a range of -40 to +120 degrees F. and 0 to 220 degrees F. Total of four thermometers.
2. Universal Hand Tachometer: Herman H. Sticht Type UH.
3. Stop Watch.
4. Stroboscope.
5. Contact Pyrometer: Thermocouple type.
6. Volt-Ohm-Ammeter Test Kit, High Current Type: Sperry "Ohmprobe".
7. Volt-Ammeter: With leads for connecting to lugs.

PART 3 EXECUTION

3.01 PRELIMINARY WORK

A. Circulating Water Systems: Prior to balancing the system, bleed all air vents so as to completely flood the system; check pumps for proper rotation; clean strainers and set balancing and system stop valves in the full-open position.

B. Ventilating and Air Conditioning Systems: Prior to balancing the system, check fans for proper rotation; check filters for cleanliness and proper installation and set dampers in the normal operating position.

3.02 BALANCING OF CIRCULATING WATER SYSTEM AND ETHYLENE GLYCOL SYSTEMS

A. Equipment Schedules and Report Sheets: Prepare itemized equipment schedules, listing all heating or cooling elements and equipment in the system to be balanced. List in order on equipment schedules, by pump or zone according to the design, all heating or cooling elements and all zone balancing valves or balancing devices. Break down schedules into zones to circuits, starting from the zone or circuit pump and terminating with the last item of equipment or transfer element in the respective zone or circuit. Include on schedule sheets, column titles listing the location, type of element or apparatus, design conditions and water balance readings. Prepare individual pump report sheets for each individual system or zone pump.

B. Balancing:
1. Place system in full automatic operation, with automatic controls set in accordance with design conditions, and allow water to reach design temperature.
2. Test pumps and balance flow. Record the following on pump report sheets:
a. Suction and discharge pressure.

b. Running amps and brake horsepower of pump motor under full flow and no flow conditions.
c. Pressure drop across pump in feet of water and total gpm pump is handling under full flow conditions.

3. Set zone or circuit balancing valve at each pump, to handle the design GPM.
4. When the design incorporates the use of air handling units containing coils, check and adjust each unit to insure the proper volume of air is passing through the coils, while the balancing procedure is in progress.
5. Check pumps for flow, after the system has been balanced.
6. Record test readings, calculations and results.

3.03 BALANCING OF VENTILATING AND AIR CONDITIONING SYSTEMS

A. Equipment Schedules and Report Sheets:
1. Prepare itemized air balance schedules for each system listing all air handling units and air outlets for each system. Schedule multi-zone systems by individual zones. Start each schedule from the inlet or the air handling unit and terminate with the last air inlet or outlet device in the system or zone.
2. Prepare individual air handling unit report sheets, noting manufacturer's published performance data.
3. Record all test readings, calculations and results.

B. Balancing:
1. Inspect All Equipment: Establish a definite operational test condition for test and air balance purposes. In accordance with test condition selected, such as minimum fresh air dampers open, turn on all air handling systems in the building, including all exhaust systems.
2. Balance a system starting with the air handling unit. Check fan speed, using a tachometer with a self-timing device and the power reading of the fan motor using a volt-amp meter. Calculate the actual brake horse power from the tachometer and volt-amp meter readings. Compare the actual fan speed reading and the motor power reading, with the air handling unit manufacturer's published performance data, and if they check within reasonable limits, make duct velocity readings on the main ducts. Drill holes in the main ducts and using a velocity measuring instrument take velocity readings. Take velocity readings in each zone duct of a multi-zone system and in addition, in the main branch ducts of a reheat type system. Close and seal test holes with metal snap hole plugs and duct tape. Calculate the cfms of the ducts. Establish the total air for the fan or system under test. Compare the design data with the test results, and if the total air is high or low, adjust the fan speed accordingly. Repeat the described test procedure for all air handling units, including all supply air, return air and exhaust air apparatus. With the total air for the system established, use the same duct velocity check system for adjusting the main splitter dampers or other volume control

devices for the various branches of the system. Test and adjust the individual air inlet or outlet devices, after the main ducts, zone ducts and branch ducts have been set at design conditions. Adjust individual air inlet and outlet devices, such as registers and diffusers, for air pattern and volume, in the manner recommended by the manufacturer of the devices. The total cfm of all inlets or outlets shall equal the total cfm of all branches, which in turn shall equal the total air volume of the air handling units. The system is balanced, when the results of the specified test procedures check with the design data, that is, fan speed and horsepower; total air by velocity readings and total air by inlet or outlet volume.

3.04 FIELD QUALITY CONTROL

A. Inspection: Prior to the environmental testing and balancing of hydronic and air distribution systems, the certified supervisor in the employ of the testing and balancing agency shall inspect the installations and notify the Director's Representative of any Work which must be performed or modified prior to initiating testing and balancing procedures.

B. Performance: Test and balance environmental hydronic and air distribution systems, including all connected equipment and apparatus, so as to conform to the design conditions. Perform the Work of this section in accordance with the published standards of the balancing council or bureau, which is certifying the member firm. Record all test readings, calculations and results.

END OF SECTION

SECTION 23 11 23

FUEL PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Piping, fittings, valves.

1.2 REFERENCES

A. API 1632 - Cathodic Protection of Underground Petroleum Storage Tanks and Piping Systems.

B. API 2000 - Venting Atmospheric and Low Pressure Storage Tanks.

C. ASME SEC IX - Welding and Brazing Qualifications.

D. ASME B16.3 - Malleable Iron Threaded Fittings.

E. ASME B31.4 - Liquid Petroleum Transportation Piping Systems.

F. ASME B31.9 - Building Service Piping.

G. ASME B36.10 - Welded and Seamless Wrought Steel Pipe.

H. ASTM A 53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.

I. ASTM A 234/A234M - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures

J. ASTM D 2310 - Machine-Made Reinforced Thermosetting Resin Pipe.

K. ASTM D 2513 - Thermoplastic Gas Pressure Pipe, Tubing and Fittings.

L. ASTM D 2996 - Filament-Wound Reinforced Thermosetting Resin Pipe.

M. NACE RP-01-69 - Control of External Corrosion on Underground or Submerged Piping Systems.

N. NFPA 30 - Flammable and Combustible Liquids Code.

O. NFPA 31 - Installation of Oil Burning Equipment.

P. NFPA 54 - National Fuel Gas Code.

Q. UL 1479 - Fire Tests of Through-Penetration Firestops.

1.3 SUBMITTALS

A. Product Data: Submit data on pipe materials, pipe fittings, valves and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

B. Manufacturer's Installation Instructions: Submit oil pump data.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Project Record Documents: Record actual locations of valves, piping system, storage tanks, and system components.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ASME SEC IX, NFPA 30, NFPA 31,NFPA 54, and NFPA 58 (as applicable).

B. Installer Qualifications: Company specializing in performing Work of this section with minimum three years documented experience and approved by manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Protect piping and fittings from soil and debris with temporary end caps and closures. Maintain in place until installation. Provide temporary protective coating on cast iron and steel valves.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Do not install underground piping when bedding is wet or frozen.

1.7 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.8 WARRANTY

A. Provide five-year manufacturer warranty for pumps and valves excluding packing.

PART 2 - PRODUCTS

2.1 NATURAL GAS PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Steel Pipe: ASTM A 53 Schedule 40 black.
   1. Fittings: ASTM A 234/A234M forged steel welding type.
   2. Joints: ASME B31.1, welded.
   3. Jacket: AWWA C105 polyethylene jacket or double layer, half-lapped 10 mil polyethylene tape.

2.2 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A 53 Schedule 40 black.
   1. Fittings: ASME B16.3, malleable iron, or ASTM A 234/A234M forged steel welding type.
   2. Joints: NFPA 54, threaded or welded to ANSI B31.1. 2” and smaller to be threaded, 2.5” and larger to be welded.

2.3 FLANGES, UNIONS, AND COUPLINGS

A. Pipe Size 2 inches and Under:
   1. Ferrous pipe: 150-pounds per square inch malleable iron threaded unions.
   2. Copper tube: 150-pounds per square inch bronze unions with brazed joints.

B. Pipe Size Over 2 inches:
   1. Ferrous pipe: 150 pounds per square inch forged steel slip-on flanges; 1/16-inch thick preformed neoprene gaskets.
   2. Copper tube: 150 pounds per square inch slip-on bronze flanges; 1/16-inch thick preformed neoprene gaskets.

2.4 FIRE STOP SYSTEMS

A. General Purpose Fire Stopping Sealant: Water based, non-slumping, premixed sealant with intumescent properties, rated for 3 hours per ASTM E 814 and UL 1479.

B. General Purpose Vibration Resistant Fire Stopping Sealant: Silicone based, non slumping, premixed sealant with intumescent properties, vibration and moisture resistant, rated for 3 hours per ASTM E 814 and UL 1479.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 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.

3.3 INSTALLATION

A. Provide non-conducting dielectric connections wherever jointing dissimilar metals. Install to NACE RP-01-69.

B. Route piping in orderly manner and maintain gradient.

C. Install piping to conserve building space and not interfere with use of space.

D. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Provide clearance for installation of insulation and access to valves and fittings.

G. Provide access where valves and fittings are not exposed.

H. Where pipe support members are welded to structural building framing, scrape, brush clean, weld, and apply one coat of zinc rich primer.

I. Provide support for utility meters in accordance with requirements of utility companies.

J. Pipe vents from gas pressure reducing valves to outdoors and terminate in weatherproof hood.

K. Prepare pipe, fittings, supports, and accessories not pre-finished, ready for finish painting.

L. Identify piping systems including underground piping.

M. Install valves with stems upright or horizontal, not inverted.

N. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

END OF SECTION

SECTION 23 31 13

METAL DUCTWORK

PART 1 GENERAL

1.01 REFERENCES

A. American Conference of Governmental Industrial Hygienists (ACGIH).

B. National Fire Protection Association (NFPA).

C. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA).

1.02 PERFORMANCE REQUIREMENTS

A. Design ductwork and supports to withstand all seismic loads. Refer to seismic loading criteria on the Contract Drawings.

B. Seismic Performance: Design and install ductwork to assure continued performance of their intended function when subjected to the specified seismic forces.

C. Seismic Performance: Design and install ductwork to assure that they remain in place with no separation of any parts when subjected to the specified seismic forces.

D. The design of the ductwork and supports shall be performed by a professional engineer experienced in the seismic design ofductwork.

1.02 SUBMITTALS

A. Shop Drawings:
   1. Layouts for areas in which it may be necessary to deviate substantially from layout shown on the Drawings. Show major relocation of ductwork and major changes in size of ducts. Minor transitions in ductwork, if required due to job conditions, need not be submitted as long as the duct area is maintained.
   2. Layout and fabrication details for cooking equipment exhaust ductwork.
   3. Layouts of mechanical equipment rooms and penthouses.
   4. Details of intermediate structural steel members required to span main structural steel for the support of ductwork.
   5. Method of attachment of duct hangers to building construction.

6. Coordinate shop drawings with related contracts prior to submission.
7. Drawings identifying seismic locations with corresponding details of pre-approved seismic restraints, with seismic loads and seismic force level (Fp) calculations; pre-engineered and stamped by a NYS Licensed Professional Engineer experienced in seismic restraint systems.

B. Product Data: Material, gage, type of joints, sealing materials, and reinforcing for each duct size range, including sketches or SMACNA plate numbers for joints, method of fabrication and reinforcing. Include ACGIH figure numbers for hoods if applicable.

C. Quality Control Submittals:
1. Seismic Restraint Manufacturer's Qualifications Data:
a. Name of firm producing the seismic restraints, business address and telephone number.
b. Period of time firm has been in the business producing seismic restraints, and names and addresses of 3 similar projects that the manufacturer has produced seismic restraints for during the past 5 years.
2. Company Field Advisor Data:
a. Name, business address and telephone number of Company Field Advisor secured for the required services.
b. Certified statement from the Company listing the qualifications of the Company Field Advisor.
c. Services and each product for which authorization is given by the Company, listed specifically for this project.
3. Manufacturer's Certificate of Compliance for Seismic Restraints: Certificate from seismic restraint manufacturer stating that the restraint and its mounting system or anchorage has been tested or analyzed and meets the requirements of NYS Building Code (Section 1621).

1.03 QUALITY ASSURANCE

A. SMACNA: Gages of materials, fabrication, reinforcement, sealing requirements, installation, and method of supporting ductwork shall be in accordance with the following SMACNA manuals, unless otherwise shown or specified:
1. HVAC Duct Construction Standards.
2. Round Industrial Duct Construction Standard.
3. Rectangular Industrial Duct Construction Standard.

B. Unless otherwise shown or specified, follow the Hood Design Data, and Construction Guidelines for Local Exhaust Systems from the ACGIH Industrial Ventilation Manual.

C. Conform to the applicable requirements of NFPA 90A, 90B, 91, 96, and 101.

D. Regulatory Requirements:

1. Seismic components shall be UL listed or California OSHPD (Office of Statewide Health Planning and Development) approved.
2. Seismic restraints for ductwork shall conform with Appendix B of the SMACNA Seismic Restraint Manual Guidelines for Mechanical systems.

E. Seismic Restraint Manufacturer's Qualifications: The firm producing the seismic restraints shall be experienced in seismic restraint work and shall have produced seismic restraints on minimum of 3 similar projects over the past 5 years.

F. Company Field Advisor: Secure the services of a Company Field Advisor from seismic restraint manufacturer for the following:
1. Render advice regarding installation and final adjustment of seismic restraint system.
2. Render advice on the suitability of each seismic restraint for its particular application.
3. Inspect completed installation of seismic restraint system and certify with an affidavit that the system is installed in accordance with the Contract Documents and is operating properly.
4. Train facility maintenance personnel on the installation of seismic restraint system and routine maintenance of the system.

PART 2 PRODUCTS

2.01 MATERIALS (Supply, Return, and general Exhaust. See plans for kitchen)

A. Sheet Metal:
1. Aluminum: ASTM B-209, Alloy 3003, Temper H-14.
2. Copper: ASTM B-370.
3. Galvanized Steel: ASTM A653, Class LFQ (lock forming quality), coating designation G-90.
4. Monel: ASTM B-127.
5. Stainless Steel: AISI Types 302, 304 and 316, as specified.

B. Duct Hangers:
1. Strap Hangers: Same material as ducts, except that hangers for stainless steel ducts in unfinished spaces may be galvanized steel.
2. Rod Type Hangers: Mild low carbon steel, unless otherwise specified; fully threaded or threaded each end, with 2 removable nuts each end for positioning and locking rod in place. Unless stainless steel, galvanized or cadmium plated; shop coat with metal primer.

C. Miscellaneous Fasteners and Upper Hanger Attachments:
1. Sheet Metal Screws, Machine Bolts and Nuts: Same material as duct, unless otherwise specified.

2. Concrete Inserts: Steel or malleable iron, galvanized; continuously slotted or individual inserts conforming with MSS SP-58, Types 18 & 19, Class A-B.
3. C Clamps: Fee & Mason Co.'s 255L with locking nut, and 255S with retaining strap.
4. Metal Deck Ceiling Bolts: B-Line Systems, Inc.'s Fig. B3019.
5. Welding Studs: Erico Fastening Systems, capacitor discharge, low carbon steel, copper flashed.
6. Structural (carbon) Steel Shapes and Steel Plates: ASTM A36, shop primed.
7. Stainless Steel Shapes and Plates: ASTM A276 and ASTM A666.
8. Machine Bolt Expansion Anchors:
   a. Non-caulking single unit type: FS FF-S-325, Group II, Type 2, Class 2, Style 1.
   b. Non-caulking double unit type: FS FF-S-325, Group II, Type 2, Class 2, Style 2.
   c. Self-drilling type: FS FF-S-325, Group III, Types 1 and 2.

2.02 FABRICATION - GENERAL

A. Fabricate ductwork from galvanized sheet metal, except as follows:
   1. Fabricate the following ductwork from aluminum:
      a. Inlet and discharge ductwork connected to cooling towers and evaporative condensers.
      b. Exhaust ductwork from shower, locker, can washing and steam service rooms, and swimming pool areas.
   2. Fabricate the following ductwork from stainless steel:
      a. Supply, return, and recirculated air ductwork connected to inlet or outlet devices installed in surgical operating, surgical scrub-up, surgical recovery and surgical work rooms. Use AISI Type 302 or 304 stainless steel.
      b. Exhaust ductwork connected to cooking equipment, dishwashing, and other scullery equipment hoods. Install stainless steel from the individual hood to its respective fan and from the fan to the point of discharge to the outside air. Use AISI Type 302 or 304 stainless steel.
      c. Exhaust ductwork connected to laboratory exhaust fume hoods. Install stainless steel from the individual hood to its respective fan and from the fan to the point of discharge to the outside air. Use AISI Type 316 stainless steel.
      d. Use stainless steel with a No. 4 finish where installed exposed in finished rooms and No. 2B finish in other locations. Use stainless steel fasteners for ductwork installed exposed in finished rooms and where fastener penetrates duct. Galvanized fasteners may be used in unfinished spaces for non-penetrating service.

B. Dissimilar Metals: Separate dissimilar metals used for ductwork with 12 oz vinyl coated woven fiberglass duct connector fabric, such as Duro Dyne's Glasseal. No separation is required between screws or rivets and the materials in which they are inserted.

2.06 VIBRATION ISOLATION FOR DUCTWORK

A. Type: Combination rubber and spring type designed for insertion in a split hanger rod for isolating ductwork from the overhead construction.
   1. Approved isolators: Amber Booth Type BSSR, Korfund Type VX, Mason Industries, Type DNHS, Vibration Eliminator Co. Type SNRC and Vibration Mountings and Controls Type RSH.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Install ductwork to allow maximum headroom. Properly seam, brace, stiffen, support and render ducts mechanically airtight. Adjust ducts to suit job conditions. Dimensions may be changed as approved, if cross sectional area is maintained.

B. Pitch horizontal ducts connected to hoods downward toward hood not less than 1 inch in 10 feet.

C. Provide necessary transformation pieces, and flexible fabric connections for ductwork connected to air handling equipment or air inlet and outlet devices.

3.02 SEALING SEAMS, JOINTS, AND PENETRATIONS

A. Seal ductwork in accordance with the SMACNA Manual except for the following:
   1. Ductwork Specified to be Insulated: Conform with Seal Class A for all pressure classes.
   2. Cooking Equipment Exhaust Ductwork: Conform with NFPA 96.
   3. Horizontal Ductwork for Dishwashing, and Other Scullery Equipment Exhausts:
      a. Continuously solder transverse joints vaportite along bottom, and up both sides 2 inches minimum.
      b. Continuously solder longitudinal seams vaportite if seams are approved to be located at bottom of duct.

3.03 HANGERS FOR DUCTS, UNDER 2 INCHES W.G.

A. Install hangers for ducts as specified in the SMACNA Manual, with the following exceptions:
   1. Rectangular ducts up to 42 inches wide, not having welded or soldered seams, and supported from overhead construction; extend strap hangers down over each side of the duct and turn under bottom of duct a minimum of 2 inches. Secure hanger to duct with 3 full thread sheet metal screws, one in the bottom and 2 in the side of the duct.

2. Rectangular ducts 43 inches wide and over, and all sizes of duct with welded or soldered seams, and supported from overhead construction; use trapeze hangers.
3. Prime coat plain steel rods threaded at the site immediately after installation with metal primer.

3.04 HANGERS FOR DUCTS, 2 INCHES W.G. AND OVER

A. Install hangers for ducts as specified in the SMACNA Manual, with the following exceptions:
1. Support rectangular ducts, regardless of size, by means of trapeze hangers, framed all four sides. Provide minimum 1 x 1 x 1/8 inch angle iron framing for duct having a maximum side dimension up to and including 36 inches in size. Install framing snug to all four sides of duct.

3.05 UPPER HANGER ATTACHMENTS

A. General:
1. Secure upper hanger attachments to structural steel or steel bar joists wherever possible.
2. Do not use drive-on beam clamps, flat bars or bent rods, as upper hanger attachments.
3. Do not attach hangers to steel decks which are not to receive concrete fill.
4. Do not attach hangers to precast concrete planks less than 2-3/4 inches thick.
5. Avoid damage to reinforcing members in concrete construction.
6. Metallic fasteners installed with electrically operated or powder driven tools may be used as upper hanger attachments, in accordance with the SMACNA Manual, with the following exceptions:
a. Do not use powder driven drive pins or expansion nails.
b. Do not attach powder driven or welded studs to structural steel less than 3/16 inch thick.
c. Do not support a load, in excess of 250 lbs from any single welded or powder driven stud.
d. Do not use powder driven fasteners in precast concrete.

B. Attachment to Steel Frame Construction: Provide intermediate structural steel members where required by ductwork support spacing. Select steel members for use as intermediate supports based on a minimum safety factor of 5.
1. Secure upper hanger attachments to steel bar joists at panel points of joists.
2. Do not drill holes in main structural steel members.

C. Attachment to Concrete Filled Steel Decks:
1. New Construction: Install metal deck ceiling bolts.
2. Existing Construction: Install welding studs (except at roof decks).
3. Do not attach hangers to decks less than 2-1/2 inches thick.

D. Attachment to Existing Cast-In Place Concrete:
   1. Secure hangers to overhead construction with self drilling type expansion anchors and machine bolts.
   2. Secure hanger attachments required to be supported from wall or floor construction with single unit expansion anchors or self drilling type expansion anchors and machine bolts.

E. Attachment to Cored Precast Concrete Decks (Flexicore, Dox Plank, Spancrete, etc.): Toggle bolts may be installed in cells for the support of ducts up to a maximum of 60 inches in width.

F. Attachment to Hollow Block or Hollow Tile Filled Concrete Decks:
   1. New Construction: Omit block or tile and pour solid concrete with cast-in-place inserts.
   2. Existing Construction: Break out block or tile to access, and install machine bolt anchors at highest practical point on side of web.

G. Attachment to Waffle Type Concrete Decks:
   1. New Construction: Install cast-in-place inserts.
   2. Existing Construction: Install machine bolt expansion anchors at highest practical point on side of web.

H. Attachments to Precast Concrete Tee Construction:
   1. Secure hangers to tees by any of the following methods:
      a. Tee hanger inserts between adjacent flanges.
      b. Install double unit expansion anchors and machine bolts at highest practical point on side of web.

I. Attachment to Wood Construction:
   1. Secure strap hangers to the sides of wood beams with one No. 18 x
      1-1/2 inch long (minimum) wood screws or 2 No. 16 x 1-1/2 inch long (minimum) drive screws. Do not hammer in wood screws.
   2. Secure rod hangers to angle iron clip angles, bolted or screwed to the sides of the wood beams with 3/8 inch bolts or 3/8 inch lag screws. Install hanger rods with a threaded end through a hole in the angle, secured with a double nut, one above and one below the angle. Do not use lag screws in wood beams, having a nominal face width under 2 inches. Install bolts or lag screws in the side of beams at mid-point or above.
   3. Pre-drill holes for lag screws 1/8 inch in diameter less than the root diameter of the lag screw thread.
   4. Where wood trusses are approved to support ductwork, hangers may be attached only to the bottom chord. Method of attachment must be specifically approved.
   5. Do not secure hanger attachments to nailing strips resting on top of steel beams.

3.07 DUCT RISER SUPPORTS, 2 INCHES W.G. AND OVER

A. Support vertical round ducts by means of double-ended split steel pipe riser clamps welded to the ducts and bearing on floor slabs or adjacent structural members, at every other floor through which the riser passes.

B. Support vertical rectangular ducts by means of two steel angles or channels, anchor bolted to floor slab or adjacent structural member at every other floor through which the riser passes. Secure steel angles or channels to a transverse joint by means of 3/8 inch bolts, or by welding. Size supports as follows:

MAXIMUM SIDE DIMENSION (inches)	SUPPORT ANGLE (inches)	SUPPORT CHANNEL (inches)	MINIMUM BEARING AT EACH END (inches)
36	1 x 1 x 1/8	1 x 1/2 x 1/8	2
48	1-1/2 x 1-1/2 x 1/8	1-1/2 x 3/4 x 1/8	3
60	2 x 2 x 1/8	2 x 1 x 1/8	3
61 - up	2-1/2 x 2-1/2 x 3/16	2 x 1 x 3/16	4

3.08 VIBRATION ISOLATION FOR DUCTWORK

A. Install vibration isolation in accordance with the manufacturer's printed installation instructions, unless otherwise specified.

B. High Velocity Ductwork Installed within Mechanical Equipment, Machine and Penthouse Mechanical Equipment Rooms: Provide combination rubber and spring type isolators, designed for insertion in a split hanger rod for overhead supported ductwork and double rubber-in-shear isolators for floor supported ductwork. Provide isolators designed for a static deflection of 1/2 inch.

END OF SECTION

SECTION 26 05 11

BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Basic Electrical Requirements specifically applicable to Division 26, 27, and 28 Sections, in addition to Division 1 - General Requirements.

1.2 REFERENCES

A. The following specifications and standards of issues listed below but referred to thereafter by basic designation only, form a part of these specifications:

1. National Electrical Code, 2008 Edition.

2. National Fire Protection Association's Recommended Practices.

3. Local, City and State Codes and Ordinances.

4. National Electrical Safety Code, 1997 Edition.

5. Underwriter's Laboratories, Inc.

6. Illuminating Engineering Society.

7. Institute of Electrical and Electronic Engineers.

8. Power Cable Engineers Association.

9. National Electrical Manufacturers Association.

10. American Standards Association.

11. American Society for Testing Materials.

12. Occupational Safety and Health Act.

13. Service requirements of serving utility company.

14. Americans with Disabilities Act (ADA).

15. Arkansas Energy Code (ASHRAE 90.1).

1.3 SUBMITTALS

A. Submit six (6) sets of shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal. The basic information for each item of equipment to be included is as

follows:

1. Index.

2. Installation and Operating Instructions

   a. Individual tabbed sections.

   b. Manufacturer descriptive literature.

   c. Applicable control diagrams.

   d. Composite wiring diagrams.

3. Each submittal sheet shall be clearly marked with equipment Catalog Number and accessory items being submitted.

1.4 REGULATORY REQUIREMENTS

A. Work shall conform to all applicable codes, specifications, local ordinances, industry standards and utility company regulations.

B. Notwithstanding any reference in the specifications to any article, device, product, material, fixture, form or type of construction by name, make or catalog number, such references shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. The Contractor, in such cases, may at his option propose any article, approved equal to or better than that specified, as approved in writing by the Engineer.

C. All materials and workmanship shall comply with all applicable codes, specifications, local ordinances, industry standards and utility company regulations.

D. In case of difference between building codes, specifications, state laws, local ordinances, industry standards, and utility company regulations and the contract documents, the most stringent shall govern. The Contractor shall promptly notify the Engineer in writing of any such difference.

E. Non-Compliance: Should the contractor perform any work that does not comply with the requirements of the applicable building codes, state laws, local ordinances, industry standards and utility company regulations, he shall bear all costs arising in correcting the deficiencies.

F. All required fees, permits and inspections shall be obtained and paid for by the contractor under the section of the specifications for which they are required.

G. All Utility costs and fees for Utility service installation, removal or relocation shall be paid for by the contractor. This is applicable for electrical power, telephone and cable television. Contractor shall paid for any material, labor or equipment costs required for Utility service installation, removal or relocation not performed by the Utility,

1.5 ELECTRICAL LICENSE REQUIREMENT

A. No person shall perform electrical work on the Contract without possessing an Arkansas State Master or Journeyman License from the Arkansas State Electrical Examiner's Board. All electrical work and apprentice electricians shall be supervised by a Master or Journeyman Electrician on a one to one ratio.

B. All electricians shall have a copy of their license with them and shall be required to show it to an appropriate inspector upon request.

1.6 PROJECT/SITE CONDITIONS

A. Install Work in locations shown on Drawings, unless prevented by Project conditions. The Engineer/Owner reserves the right to relocate any device a maximum distance of 6'-0" at the time of installation without an extra cost being incurred.

B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Engineer before proceeding.

1.7 CONTRACTOR REVISED DRAWINGS

A. The Contractor shall, during the progress of the work, keep an accurate record of all changes and corrections from the layouts shown on the drawings. Record of changes may be kept by accurately making all changes on a set of prints during the progress of the job.

B. Upon completion of the work and prior to final payment, the Contractor shall furnish to the Engineer, one set of "contractor revised" reproducibles, legibly and accurately marked to indicate all changes, additions, deletions, etc., from the contract drawings.

1.8 GUARANTEE

A. The work herein specified shall be free from defects in workmanship and material under normal use and service. If, within twelve (12) months from date of substantial completion and Owner acceptance of the work herein described, any of the equipment or materials, or the installation thereof, is found to be defective in workmanship or material, it shall be replaced or repaired free of charge.

B. The Contractor shall, after completion of the original test of the installation, and acceptance by the Engineer, provide any service incidental to the proper performance of the electrical systems under guarantees outlined above for a period of one (1) year.

1.9 OPERATING AND MAINTENANCE MANUALS

A. After approval of materials and equipment for use in this project, 3 copies of an Operation and Maintenance Manual shall be submitted for approval.

B. The basic information for each item of equipment to be included is as follows:

1. Index

2. Maintenance and operating instructions

   a. Manufacturer's descriptive literature and maintenance manuals

   b. An Approved Set of Shop drawings

   c. Applicable control diagrams

   d. Composite wiring diagrams as applicable showing all motor controllers, relays, etc., with interlocking provisions as built in the job, along with a written description of the control sequence if applicable.

   e. Spare parts list (when parts are provided) and listing of part suppliers and their addresses

   g. Power riser or single line diagram of the "as built" building electrical distribution system.

   h. Submit fire alarm system components inspection testing forms and system certification forms as required by NFPA 72.

C. Upon final approval, submit one (1) bound copy of the approved Operation and Maintenance Manual to the Architect/ Engineer and hold two (2) copies for instruction of Owner as hereinafter specified.

PART 2 - PRODUCTS

2.1 UL LISTING

A. Where the Underwriter's Laboratories have an applicable standard, the product shall be listed with UL and shall be so marked.

B. The Contractor shall bear all responsibility for any work which he performs that voids any UL listings of any equipment.

2.2 SUBSTITUTIONS

A. Each Section of the Project Manual, when applicable, has a paragraph entitled “Manufacturers”. If “Engineer Approved Equal” is not in the list of manufacturers, no substitutions will be accepted. Submit one of the manufacturers listed.

B. The Engineer does not give any prior approvals on submittals. Do not call the Engineer for prior approval.

PART 3 - EXECUTION

3.1 600 VOLT INSULATION TEST

A. Prior to energizing the electrical system the contractor shall provide insulation resistance tests for all distribution and utilization equipment. The Contractor shall provide a suitable and stable source of test power. The insulation test shall be a "megger" test at 500 volts D.C. for one-half minute. A test report shall be submitted to the Engineer. The minimum insulation resistance for No. 12 AWG conductors shall be 1,000,000 ohms and for larger conductors shall be 250,000 ohms. Conductors testing below the minimum insulation resistance shall be replaced and tested again.

3.2 CONTINUITY TEST

A. The Contractor shall perform a continuity test on the entire electrical system prior to energizing the system to insure proper cable connections.

3.3 CONNECTION TORQUE TESTS

A. All No. 1/0 AWG and larger conductors with bolted connections shall be torque tested using a torque wrench. Torque shall be to National Electrical Testing Association's (NETA) Standards.

3.4 REMOVAL OF RUBBISH

A. Contractor shall remove his rubbish from building site at intervals and shall maintain the spaces allotted him in an orderly manner. On completing his work, and prior to submission of final estimate, he shall remove all tools, appliances, material and rubbish from the grounds.

3.5 FIRE ALARM SYSTEM TEST

A. The fire alarm system shall be tested by the company responsible for the installation. The fire alarm contractor shall submit a certification that the system operates properly.

3.6 GROUND RESISTANCE MEASUREMENTS

A. Ground resistance measurements of each ground rod shall be taken and certified by the Contractor to the Engineer. No part of the electrical distribution system shall be energized prior to the resistance testing of that system's ground rods and grounding system and submission of test results to the Engineer. Test reports shall indicate the location of the ground rod and grounding system and the resistance and the coil conditions at the time the test was performed. When the building water service is used as a ground of part of the grounding system, ground-resistance measurements shall also be made of this connection. Ground resistance measurements shall be made in normally dry weather, not less than 48 hours after rainfall, and with the ground under test isolated from other grounds. The resistance to ground shall be measured using the fall-of-potential method described in IEEE No. 142.

3.7 MECHANICAL OPERATION TESTS

A. All electrical equipment, such as switches, circuit breakers, etc., shall be tested by operating the device to verify that the mechanical portions of the device are

functioning.

3.8 ROTATIONAL TESTS

A. The Contractor shall assist Division 15 in performing rotational tests on all motors. If rotational tests determine that conductors must be transposed to change direction of rotation, the conductors shall be changed at the make-up box on the motor; or if the change is made elsewhere, then the conductor's color coding shall be changed.

3.9 INSTRUCTING OWNER'S REPRESENTATIVE

A. The Contractor shall instruct representatives of the Owner in the proper operation and maintenance of all elements of the Electrical system.

B. Contractor shall spend not less than one-half (1/2) day in such formal instruction to fully prepare the Owner's representative to operate and maintain the Electrical systems.

END OF SECTION

SECTION 26 05 19

BUILDING WIRE AND CABLE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Building wire and cable.

B. Wiring connectors and connections.

1.2 RELATED SECTIONS

1.3 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

B. UL 83 - Thermoplastic Insulated Wires and Cables.

C. UL 486 A - Wire Connectors and Soldering Lugs for Use with Copper Conductors.

D. UL 486 C - Splicing Wire Connectors.

E. UL 1581 - Reference Standard for Electrical Wires, Cables and Flexible Cords.

1.4 SUBMITTALS

A. Submit under provisions of Division 1 and Section 260511.

B. Product Data: Provide for each cable assembly type.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years documented experience.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.7 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Conductors shall be copper.

C. Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet Project Conditions.

D. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

1.8 COORDINATION

A. Determine required separation between cable and other work.

B. Determine cable routing to avoid interference with other work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS - BUILDING WIRE AND CABLE

A. Triangle.

B. American.

C. Engineer Approved.

2.2 BUILDING WIRE AND CABLE

A. Description: Single conductor insulated wire.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

D. Insulation: ANSI/NFPA 70, Type THW (feeder circuits) and THHN/THWN (branch circuits).

2.3 WIRING CONNECTORS

A. All cable and wire terminals, taps and splices shall be made secure with compression type connectors, approved for the service. Connections shall be installed with approved tools and dies to assure a permanent secure joint. Compression joints shall be cleaned, made smooth with insulating compound, wrapped with varnish cambric and insulated with approved electrical grade plastic tape. Where conductors are to be connected to metallic surfaces, the

coated surfaces of the metal shall be polished before installing the connector. Lacquer coating of conduits shall be removed where ground clamps are to be installed. Provide all necessary hangers, racks, cleats, and supports required to make a neat installation. Wire connectors shall conform to UL 486.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to installation verify that interior of building has been protected from weather.

B. Prior to installation verify that mechanical work likely to damage wire and cable has been completed.

3.2 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.3 WIRING METHODS

A. Interior Locations: Use only building wire, Type THW or use THHN/THWN insulation, in raceway unless otherwise indicated on the Drawings.

B. Wet or Damp Interior Locations: Use only building wire, Type THW or THHN/THWN in raceway or liquid tight flexible conduit.

C. Exterior Locations: Use only building wire, Type THW or THHN/THWN insulation in raceway.

D. Underground Installations: Use only building wire, Type THW or THHN/THWN insulation in raceway.

E. Use wiring methods indicated on Drawings.

F. On the loadside of GFIC circuit breaker, use only Type XHHW conductors.

3.4 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Use solid conductors for feeders and branch circuits No 10 AWG and smaller, except branch circuits to motors shall be stranded copper for flexibility.

C. Use stranded conductors for control circuits 24 volts and below. Minimum size shall be No. 16 AWG.

D. Use conductors not smaller than No. 12 AWG for power and lighting circuits and

120 volt control circuits.

E. Conductors shall be continuous from outlet to outlet.

F. Use No. 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 100 feet or where the distance to the first outlet exceeds 50 feet.

G. Use No. 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 200 feet.

H. Pull all conductors into raceway at same time.

I. Use suitable wire pulling lubricant for building wire No. 4 AWG and larger.

J. Protect exposed cable from damage.

K. Support cables above accessible ceiling, using spring metal clips on cable ties to support cables from structure. Do not rest cable on ceiling panels.

L. Use suitable cable fittings and connectors.

M. Neatly train and lace wiring inside boxes, equipment, and panelboards.

N. Clean conductor surfaces before installing lugs and connectors.

O. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

P. Use sleeve compression connectors for copper conductor splices and taps, No. 6 AWG and larger. Insulate any uninsulated conductors and connector with heat shrink insulation rated 600 volts.

Q. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, No. 8 AWG and smaller.

R. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, No. 10 AWG and smaller.

S. Route circuits at own discretion; however, circuit numbers shall be according to Drawings.

T. On three phase, four wire systems, do not use a common neutral for more than 3 circuits.

U, On single phase, three wire systems, do not use a common neutral for more than 2 circuits.

V. Where a common neutral is run for 2 or 3 homerun circuits, connect phase

conductors to breakers in panel which are attached to separate phase legs in order that the neutral conductors will carry only the unbalanced current. Neutral conductors shall be of same size as phase conductors unless specifically noted otherwise.

W. Run conductors of same circuit in same conduit.

X. Run conductors of different voltage system in separate conduits.

Y. Color code conductors as follows:

	480Y277 Volts	240/120 Volts
Phase A	Brown	Black
Phase B	Orange	Red
Phase C	Yellow	
Ground	Green	Green
Neutral	Gray	White

	208Y120 Volts	Switchlegs
Phase A	Black	Violet
Phase B	Red	Pink
Phase C	Blue	
Ground	Green	
Neutral	White	
Isolated Ground	Green w/ Yellow Stripe	

Z. Contractor shall not install more than three (3) current-carrying conductors in one conduit without derating the conductors per NFPA 70 (NEC).

AA. Where cables not in conduit pass through floors, cables shall be enclosed in conduit extending at least 6 inches above the floor.

BB. Cables shall be protected from physical damage where necessary by conduit.

CC. All cable splices shall be made in boxes.

DD. The radius of bends in cables shall not be less than five times the diameter of the cable.

EE. Cables shall be secured by staples, straps, j-hooks or similar fittings every 4-1/2 feet and within 12 inches of every cabinet, box and fitting.

FF. Do not pull cable sheaths back more than necessary to separate conductors.

GG. Do not score conductors when peeling back conductor insulation. Scored conductors will be replaced.

HH. Do not cut off strands from stranded conductors at terminations. Conductors with

strands missing shall be replaced.

II. Kinked, torn, or twisted cable sheaths are unacceptable and shall be replaced.

JJ. Install wire and cables to avoid chemicals, cold temperature bending and different lengths of conductors of same circuit.

KK. Make sure conduits are properly terminated, reamed and brushed before installation of wire and cables.

LL. Cable sheaths shall be held in place by strain relief fittings.

MM. Verify proper conductor location at each termination before energizing.

NN. All parallel conductors shall be of the same length, type, size and shall have the same connector pressures.

3.5 INTERFACE WITH OTHER PRODUCTS

A. Identify wire and cable under provisions of Section 16195.

B. Identify each conductor with its circuit number or other designation indicated on Drawings in each junction box and in each panelboard.

3.6 FIELD QUALITY CONTROL

A. Perform field inspection and testing.

B. Inspect wire and cable for physical damage and proper connection.

C. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.

D. Verify continuity of each branch circuit conductor.

END OF SECTION

SECTION 26 05 25

CONDUIT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Rigid steel conduit.

B. Flexible metal conduit.

C. Liquidtight flexible metal conduit.

D. Electrical metallic tubing.

E. Surface mounted raceway.

F. PVC conduit.

G. Fittings and conduit bodies.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.

B. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

C. ANSI/NFPA 70 - National Electrical Code.

D. NECA "Standard of Installation."

E. NEMA TC 3 - PVC Fittings to Use with Rigid PVC Conduit and Tubing.

F. UL 1 - Flexible Metal Conduit.

G. UL 5 - Surface Metal Raceways and Fittings

H. UL 6 - Rigid Metal Conduit.

I. UL 360 - Liquid-tight Flexible Steel Conduit.

J. UL 652 - Schedule 40 and 80 Rigid PVC Conduit.

1.04 DESIGN REQUIREMENTS

A. Conduit Size: ANSI/NFPA 70.

1.05 SUBMITTALS

A. Submit under provisions of Division 1 and Section 260511.

B. Product Data: Provide for metallic conduit, flexible metal conduit, liquidtight flexible metal conduit, metallic tubing, fittings and conduit bodies.

1.06 PROJECT RECORD DOCUMENTS

A. Accurately record actual routing of conduits larger than 2 inches.

1.07 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle Products to site.

B. Inspect all conduit for damage.

C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

D. Protect PVC conduit from sunlight.

1.09 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Verify routing and termination locations of conduit prior to rough-in.

C. Route conduit as shown on Drawings in approximate locations unless specifically dimensioned. Route as required to complete wiring system.

PART 2 PRODUCTS

2.01 CONDUIT REQUIREMENTS

A. Minimum Size: 3/4 inch unless otherwise specified.

B. Underground Installations:

1. Below Grade: Conduit installed below grade shall be Schedule 40 PVC. All elbows shall be galvanized rigid steel conduit (RSC).

2. Under or In Concrete Floor Slabs: PVC conduit shall not be installed under concrete floor slabs or imbedded within concrete floor slabs, except for the main service feeder from the Utility transformer or as specifically called out on plans.

3. Concrete Encasement: Underground conduits from the utility transformer to the Main Disconnect Switch shall be encased in 3” of concrete.

C. Outdoor Locations, Above Grade., On Roofs and on Canopies: Use galvanized rigid steel conduit.

D. Dry Locations:

1. Concealed: Use electric metallic tubing.

2. Exposed: Use galvanized rigid steel conduit in unfinished areas below 10’-0” unless noted otherwise.

E. Temperature Controls: Use electrical metallic tubing (EMT) conduit for line voltage and HVAC equipment control. Refer to Division 15 for specific requirements and locations.

F. All final connections to light fixtures, transformers, mechanical/HVAC equipment, pumps, water heaters, etc., and any equipment subject to vibration shall be in liquid-tight flexible metal conduit.

G. Minimum size of flexible metal conduit shall be 3/4” except for tap connections to luminaires, which shall be no smaller than 3/8”. Length of flexible metal conduit for luminaire tap connections shall not exceed 6’–0”.

2.02 RIGID STEEL CONDUIT

A. Manufacturers:

1. Allied.

2. Triangle.

3. Engineer Approved.

B. Rigid Steel Conduit: ANSI 80.1

C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; material to match conduit.

2.03 FLEXIBLE METAL CONDUIT

A. Manufacturers:

1. Allied.

2. Triangle.

3. Engineer Approved.

B. Description: Interlocked steel construction.

C. Fittings: ANSI/NEMA FB 1.

2.04 LIQUIDTIGHT METAL CONDUIT

A. Manufacturers:

1. Allied.

2. Triangle.

3. Engineer Approved.

B. Description: Interlocked steel construction with PVC jacket.

C. Fittings: ANSI/NEMA FB 1.

2.05 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:

1. Allied.

2. Triangle.

3. Engineer Approved.

B. Description: ANSI C80.3; galvanized tubing.

C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; die-cast compression type.

2.06 SURFACE METAL RACEWAY

A. Manufacturers:

1. Wiremold.

2. Panduit

3. Engineer Approved.

B. Description: Surface metal raceway with hidden supports.

C. Fittings Boxes and Conduit Bodies: As manufactured by surface metal raceway manufacturer.

2.07 NONMETALLIC CONDUIT

A. Manufacturers:

1. Carlon.

2. Engineer Approved.

B. Description: NEMA TC 3; Schedule 80 PVC.

C. Fittings and Conduit Bodies: NEMA TC 3.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install conduit in accordance with NECA "Standard of Installation."

B. Install surface metal raceway in accordance with manufacturer's directions.

C. Arrange supports to prevent misalignment during wiring installation.

D. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers. Supports shall be installed within 3 feet of every outlet box, junction box, panel, or other tubing terminations. Fastening of unbroken lengths shall be permitted to be increased to a distance of 5 feet where structural members do not readily permit fastening within 3 feet. Do not space supports further than 10 feet apart.

E. Group related conduits; support using conduit rack. Construct rack using steel channel.

F. Fasten conduit supports to building structure and surfaces under provisions of Section 16190.

G. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.

H. Do not attach conduit to ceiling support wires.

I. Arrange conduit to maintain headroom and present neat appearance.

1. Interior: All conduit in finished spaces shall be concealed unless specifically noted otherwise or unless construction prohibits.

2. Exterior: All branch circuit conduit serving exterior, building mounted light fixtures, receptacles, and other devices/equipment on finished-out exterior building walls shall be concealed unless specifically noted otherwise or unless construction prohibits.

J. Route all conduit parallel and perpendicular to walls. This includes conduit installed above ceilings, in attics, and in crawl spaces.

K. Install insulated bushings or approved equivalent on each end of all conduit.

L. Install raintight conduit hubs on all exterior rigid galvanized steel conduit where it enters NEMA 3R rated enclosures on the top or sides.

M. Maintain 12 inch clearance between conduit and surfaces with temperatures

exceeding 104 degrees F.

N. Cut conduit square using saw or pipe cutter; de-burr cut ends.

O. Bring conduit to shoulder of fittings; fasten securely.

P. Install no more than equivalent of four 90-degree bends between boxes. Use factory elbows for all 90 degree bends.

Q. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

R. Provide suitable fittings to accommodate expansion and deflection where conduit crosses expansion joints.

S. Use suitable caps to protect installed conduit against entrance of dirt and moisture during construction.

T. Ground and bond conduit under provisions of Section 16170.

U. Identify conduit under provisions of Section 16195.

V. Provide suitable pullboxes in all conduit runs as required by the National Electrical Code and as required to facilitate wire installation.

W. Holes for passage of conduits through all one-hour and two-hour drywall partitions shall be neatly cut to the required size. If holes are cut larger than necessary, they shall be covered with two (2) additional pieces of 5/8 inch type X gypsum wallboard, each 8 inches by 16 inches with a half circular cutout of the proper size, one (1) layer on one-hour partitions and two (2) layers on two-hour partitions.

X. Holes for passage of conduits through one-hour, two-hour and four-hour masonry walls shall be fireproofed. Fireproofing materials shall be as follows:

1. Cellular Glass Insulation: Pittsburgh Corning Corp. Foamglas "Regular" or UL rated or UNI-JAC Ul rated pipe insulation, or approved equal.
2. Fire Retardant Putty: IPC Flamesafe Type FAS500 or FST600 Series, or improved equal, for one-hour and two-hour walls.
3. IPC/KB5 Mortar Seal, or approved equal (full depth of wall) for four-hour walls.

Y. Holes for passage of conduits through masonry floors shall be fireproofed. Fireproofing material shall be Firestop Compound - IPC Flamesafe Type 500/FST 600, or approved equal, filled to full depth of slab. Minimum annular space around conduit shall be 3/16 inch.

Z. Refer to Architectural drawings for locations of fire-rated walls, ceilings and floors.

AA. Not used.

BB. All flexible conduit in Mechanical Rooms and outside shall be liquidtight flexible conduit.

CC. All conduits with conductors inside that enter a building wall below grade shall have a fitting equal to OZ Type CSBI installed inside conduit.

DD. Conduits which enter refrigerated areas, such as walk-in coolers and wall-in freezers, shall have a seal-off installed on the non-refrigerated side of the conduit where the conduit exits or enters the refrigerated area.

EE. Make sure conduits are properly terminated, reamed and brushed before installation of wire or cable.

FF. Not used.

GG. Structural Engineer shall approve placement of conduits in all concrete slabs, beams and columns.

HH. Underground duct installation requirements:

1. Ducts shall be in accordance with the NEC, as shown on the drawings, and as specified.
2. Underground conduit stub-ups and sweeps to equipment inside of buildings shall be galvanized rigid steel, and shall extend a minimum of 5 feet outside of building foundation or as directed ion plans..
3. Stub-ups, sweeps, and risers to equipment mounted on outdoor concrete slabs shall be galvanized rigid steel, and shall extend a minimum of 5 feet away from edge of slab.
4. Install insulated grounding bushings on the terminations.
5. Rigid steel conduit turns of direction for all duct lines shall have minimum 4 feet radius in the horizontal and vertical directions. Sweeps for all duct lines shall have a minimum 40 feet radius in the horizontal and 4 feet in the vertical directions. Where a 40 feet radius is not possible, horizontal turns of direction shall be rigid steel.
6. All multiple conduit runs shall have conduit spacers. Spacers shall securely support and maintain uniform spacing of the duct assembly a minimum of 3 inches above bottom of trench during the concrete pour. Spacer spacing shall not exceed 5 feet.
7. Duct lines shall be installed no less than 12 inches from other utility systems, such as water, sewer, and chilled water.
8. Clearances between individual ducts:
   a. For like services, not less than 3 inches.

b. For power and signal services, not less than 6 inches.

c. Provide plastic spacers to maintain clearances.

d. Provide nonferrous tie wires to prevent displacement of the ducts during pouring of concrete or backfill. Tie wires shall not act as substitute for spacers.

9. Couple the ducts with proper couplings. Stagger couplings in rows and layers to insure maximum strength and rigidity of the duct bank.

10. Keep ducts clean of earth, sand, or gravel during construction, and seal with tapered plugs upon completion of each portion of the work.

3.02 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance of partitions and other elements.

B. Pullboxes shall be provided at points shown on the plans or required to overcome mechanical difficulties due to arrangement of runs or the fixed characteristics of the building construction.

C. All threaded conduit shall be secured to boxes, cabinets, panels, etc. by means of a threaded bushing on the inside and locknutted on the box exterior and interior.

3.03 USE OF THE FOLLOWING IS PROHIBITED

A. EMT crimp-on, tap-on, indenter type fittings.

B. EMT set- screw fittings on conduit smaller than 2”.

C. PVC under building concrete floor slabs, imbedded in building concrete floor slabs, inside buildings and above grade.

D. All thread nipples in other than dry locations.

E. Wooden plugs inserted in concrete or masonry units as bases for fastening conduits, tubing, boxes, cabinets, or other equipment.

F. Installation of conduit or tubing which has been crushed or deformed.

G. LB Fittings. All bends shall be factory made 90 degree elbows.

H. Type ENT tubing.

I. Armored cable.

J. Metal-clad cable (Type MC).

K. Type NMR (Romex) cable.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Grounding electrodes and conductors.

B. Equipment grounding conductors.

C. Bonding.

D. Chemicals.

E. Conduit.

1.2 RELATED SECTIONS

1.3 REFERENCES

A ANSI/NFPA 70 - National Electrical Code.

B. UL 467 - Grounding and Bonding Equipment.

1.4 GROUNDING ELECTRODE SYSTEM

A. Metal underground water pipe, if any.

B. Metal frame of the building, if any.

C. Electrode.

D. Rod electrode.

E. "GEM encased in direct contact with earth.

1.5 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: No greater than 5 ohms.

1.6 SUBMITTALS

A. Submit under provisions of Division 1 and Section 260511.

B. Product Data: Provide data for grounding electrodes and connections.

C. Test Reports: Indicate overall resistance to ground and resistance of each electrode.

D. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of exothermic connectors.

1.7 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 1.

B. Accurately record actual locations of grounding electrodes.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum 3 years documented experience.

1.9 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc.

PART 2 - PRODUCTS

2.1 ROD ELECTRODE

A. Material: Copper clad steel.

B. Diameter: 5/8 inch.

C. Length: 10 feet.

2.2 WIRE

A. Material: Stranded or solid copper.

B. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

C. Wire shall conform to Section 16123.

2.3 CONNECTIONS

A. Compression connector.

2.4 CHEMICALS (as required)

A. Ground enhancement materials (50 lbs. minimum per rod).

B. Cadweld "GEM" system, or approved equal.

2.5 CONDUIT

A. Conduit shall conform to Section 16111.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that final backfill and compaction has been completed around area where chemical ground is to be installed.

3.2 INSTALLATION

A. Install Products in accordance with manufacturer's instructions.

B. Auger a 3 inch diameter hole to a dept of 9-1/2 feet.

C. Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground. Drive rod 1 foot into ground. Make compression connection connection. Pour chemicals (as required) around rod. Tamp around rod. Pour water in augured hole. Remove excess water from hole. Fill remainder of augured hole with soil. Tamp soil.

E. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus or bushing.

F. Size and type of green equipment ground conductors and method of securing then to obtain electrical continuity and effective grounding as per NFPA 70 - National Electrical Code, Article 250. Conduit shall not be used for grounding.

G. Neutrals of lighting systems shall be grounded in accordance with NFPA 70 - National Electrical Code.

H. All metal raceway system, including cabinets, conduit and boxes, shall be grounded in accordance with the NFPA 70 - National Electrical Code.

I. An equipment ground conductor shall be installed in all conduits.

J. Install a grounding electrode and grounding electrode conductor at each main distribution panel and dry type transformer.

K. The grounding electrode shall be connected to the metal structure of all buildings with metal structures and to a 1-1/2 inch or larger cold water pipe, if metallic.

L. Install isolated ground conductors all the way back to the Main Distribution Panel for 240 and 208 volt services, and back to dry type transformer ground in 460 volt services.

M All unburied grounding conductors shall be installed in conduit.

N. Provide grounding of pad-mounted transformer as required by the serving Utility.

3.2 FIELD QUALITY CONTROL

A. Inspect equipment grounding conductors and connections for tightness and proper installation.

B. Use suitable test instrument to measure resistance to ground of system. Perform testing in accordance with test instrument manufacturer's recommendations using the fall- of-potential method.

C. Grounding conductors shall be so installed as to permit shortest and most direct path from equipment to ground. All connections to ground conductors shall be accessible for inspections. All contact surfaces shall be thoroughly cleaned before connections are made to insure good metal-to-metal contact.

END OF SECTION

SECTION 26 05 34

BOXES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Wall and ceiling outlet boxes.

B. Floor boxes.

C. Pull and junction boxes.

1.2 RELATED SECTIONS

1.3 REFERENCES

A. ANSI/NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.

B. ANSI/NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

C. ANSI/NFPA 70 - National Electrical Code.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

E. UL 38 - Boxes for Use with Fire-Protection Signaling Systems, Manually Actuated Signaling.

F. UL 50 - Cabinets and Boxes.

G. UL 514A - Metallic Outlet Boxes.

H. UL 514B - Fittings for Conduit and Outlet Boxes.

I. UL 996 - Electrical Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations.

J. UL 1241 - Junctions Boxes for Swimming Pool Lighting Fixtures.

K. UL 1773 - Termination Boxes.

L. UL 65 - Wired Cabinets.

1.4 SUBMITTALS

A. Submit under provisions of Division 1 and Section 260511.

B. Product Data: Provide for each cable assembly type.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.

1.5 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 1.

B. Accurately record actual locations and mounting heights of outlet, pull, and junction boxes.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.7 PROJECT CONDITIONS

A. Verify field measurements are as shown on Drawings.

B. Verify locations of all outlets prior to rough-in.

C. Electrical boxes are shown on Drawings in approximate locations unless dimensioned. Install at location required for box to serve intended purpose. The exact location of all electrical boxes shall be as approved by Engineer who reserves the right to change any outlet for a distance of 6 feet in any direction from position shown on plans, before work is roughed-in, without extra charge.

PART 2 - PRODUCTS

2.1 OUTLET BOXES

A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, galvanized steel.

1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported, include 1/2 inch male fixture studs where required.

2. Concrete Ceiling Boxes: Concrete type.

3. Receptacle, single switch, and 2 gang switch boxes for wood studs shall be Raco #194 or #235 with plaster ring of proper depth.

4. Receptacle, single switch, and 2 gang switch boxes for metal studs shall be Raco #196 or #235 with plaster ring for proper depth.

5. Gang switches of 3 or more devices for wood or metal studs and exposed work shall be Raco #950 Series, appropriate gang box and raised cover.

6. Lighting fixture outlet boxes for wood or metal studs, masonry walls, and

furred ceilings shall be Raco #166, #167, or Raco #194 or #235 with plaster ring.

7. Junction boxes for wood or metal studs, masonry walls, furred ceilings and interior exposed work shall be Raco #231, #232, #233, or #235.

8. Receptacle boxes for masonry walls shall be Raco #695 or #191 with #785 device cover.

9. Switches in 6 inch and wider masonry walls shall be 3-1/2 inch deep masonry boxes of gang required. Masonry boxes in 4 inch walls shall be 2-1/2 inches deep.

10. Television outlet boxes shall be Raco #246, 4-1/16 inch box with #836 device cover ring. Telephone outlet boxes shall be Raco #256.

11.. Outlet boxes for interior exposed work shall be Raco #191, #192, #231, or #232 boxes with 1/2 inch raised, 4 inch square cover of appropriate configuration.

B. Cast Boxes: NEMA FB 1, Type FD, aluminum. Provide gasketed cover by box manufacturer.

C. Boxes shall be oversized when required by Table 370-16(a) of the National Electrical Code.

2.2 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

B. Surface-Mounted Cast Metal Box: NEMA 250, Type as required; flat-flanged, surface-mounted junction box.

1. Material: Galvanized steel.

2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.

B. Install electrical boxes to maintain headroom and to present neat mechanical appearance.

C. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

D. Install boxes to preserve fire resistance rating of partitions and other elements.

E. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.

F. Use flush mounting outlet boxes in finished areas, unless noted otherwise on the Drawings.

G. Do not install flush mounting boxes back-to-back in walls; provide minimum 6 inch separation. Provide minimum 24 inch separation in acoustic rated walls. See Architectural floor plans for acoustic rated wall locations.

H. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

I. Use stamped steel bridges to fasten flush mounting outlet box between studs.

J. Install flush mounting box without damaging wall insulation or reducing the effectiveness.

K. Use adjustable steel channel fasteners for hung ceiling outlet box.

L. Do not fasten boxes to ceiling support wires.

M. Support boxes independently of conduit.

N. Use gang box where more than one device is mounted together. Do not use sectional box.

O. In other than masonry, use 4 inch square by 1-1/2 inch minimum box with plaster ring for single devices.

P. Use cast outlet box in exterior locations exposed to the weather and wet locations.

Q. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.

R. Set floor boxes level.

S. Large Pull Boxes: Boxes larger than 100 cubic inches in volume or 12 inches in any dimension.

1. Interior Dry Locations: Use hinged enclosure.

2. Other Locations: Use surface-mounted cast metal box.

T. Locate boxes so outlets are not obstructed by pipes, ducts, or other items.

U. Boxes for switches shall generally be located within 6 inches of door jamb, opposite side from the door hinges.

V. Pullboxes shall be provided at points shown on plans or required to overcome mechanical difficulties due to arrangement of runs or the fixed characteristics of the building construction. No runs of over 100 feet shall be made without use of pullbox.

W. All boxes shall have covers. All boxes installed above a ceiling and installed in unfinished spaces (Mechanical and Electrical Rooms, etc.) shall have the covers clearly and legibly marked with the circuits contained within them.

X. All flush-mounted boxes shall come within 1/4 inch of finished surface of wall.

Y. Fireproof all poke-through devices in accordance with manufacturer's directions.

3.2 INTERFACE WITH OTHER PRODUCTS

A. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

B. Coordinate mounting heights and locations of outlets mounted above counters, branches and backsplashes with Architect prior to rough-in.

C. Position outlet boxes to locate luminaires as shown on reflected ceiling plan.

3.3 ADJUSTING

A. Adjust flush-mounting outlets to make front flush with finished wall material.

B. Install knockout closure in all unused box openings.

END OF SECTION

SECTION 26 05 35

SUPPORTING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conduit, cable and equipment supports.

B. Anchors and fasteners.

1.2 REFERENCES

A. NECA - National Electrical Contractors Association.

B. ANSI/NFPA 70 - National Electrical Code.

C. UL 514B - Fittings for Conduit and Outlet Boxes.

1.3 RELATED SECTIONS

1.4 SUBMITTALS

A. Submit under provisions of Division 1 and Section 260511.

B. Product Data: Provide manufacturer's catalog data for fastening systems.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.1 PRODUCT REQUIREMENTS

A. Materials and Finishes: Provide adequate corrosion resistance.

B. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.

C. Perforated strap iron will not be acceptable as hanger or fastening material.

D. Plastic tie wraps will not be acceptable as support materials except for securing light fixture whips.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation".

C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.

D. Obtain permission from the Engineer before using powder-actuated anchors.

E. Obtain permission from the Engineer before drilling or cutting structural members.

F. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

G. Install surface-mounted cabinets and panelboards with minimum of four anchors. Provide blocks between studs to support anchors.

H. In wet and damp locations use steel channel supports to stand cabinets and panelboards one inch off wall.

I. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

J. All conduits, both horizontal and vertical, shall be accurately supported. Each hanger shall be properly sized to fit supported pipe or conduit.

K. Where lines are supported under concrete construction, hanger rods shall be secured with concrete inserts.

L. All hangers shall be so located as to properly grade and support horizontal conduits without appreciable sagging of these lines.

M. Where multiple conduits are run horizontally at the same elevation and grade, they may be supported on trapezes of channels suspended on rods. Trapeze numbers, including suspension rods, shall be properly sized for number, size and loaded weight of conduits to be supported.

N. Conduit supports shall be installed within 3 feet of each coupling, connector and box.

O. Ceiling support wires shall not be used to support cables, conduit or boxes.

P. Electrical contractor shall install his own supports for his equipment.

END OF SECTION

SECTION 26 05 74

EQUIPMENT WIRING SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Electrical connections to plumbing, appliances, and mechanical equipment specified under other sections or Owner furnished equipment.

1.2 RELATED SECTIONS

A. Section 260525 - Conduit.

B. Section 260519 - Building Wire and Cable.

C. Section 260534 - Boxes.

1.3 REFERENCES

A. NEMA WD 1 - General Purpose Wiring Devices.

B. NEMA WD 6 - Wiring Device Configurations.

C. ANSI/NFPA 70 - National Electrical Code.

D. UL 498 - Attachment Plugs and Receptacles.

E. UL 1010 - Receptacle Plug Combinations for Use in Hazardous (Classified) Locations.

1.4 SUBMITTALS

A. Submit under provisions of Division 1 and Section 260511.

B. Product Data: Provide wiring device manufacturer's catalog information showing dimensions, configurations, and construction.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.6 COORDINATION

A. Obtain and review shop drawings, product data, and manufacturer's instructions for equipment furnished under other sections.

B. Determine connection locations and requirements.

C. Sequence rough-in of electrical connections to coordinate with installation schedule for equipment.

D. Sequence electrical connections to coordinate with start-up schedule for equipment.

PART 2 - PRODUCTS

2.1 CORDS AND CAPS

A. Manufacturers:

1. Hubbell.

2. Pass & Seymour.

3. Arrow-Hart.

B. Attachment Plug Construction: Conform to NEMA WD 1.

C. Configuration: NEMA WD-6; match receptacle configuration at outlet provided for equipment.

D. Cord Construction: ANSI/NFPA 70, Type SO multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.

E. Size: Suitable for connected load of equipment, length of cord, and rating at branch circuit overcurrent protection.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using liquidtight flexible conduit with watertight connectors.

C. Make wiring connections using wire and cable with insulation suitable for temperatures encountered in heat producing equipment.

D. Provide receptacle outlet where connection with attachment plug is indicated.

Provide cord and cap where field-supplied attachment plug is indicated.

E. Provide suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

F. Install disconnect switches, controllers, control stations, and control devices as indicated and as required by applicable codes.

G. Provide interconnecting conduit and wiring between devices and equipment where indicated.

H. All flexible conduit to pumps, chillers, air handling units, outdoor equipment, and water heaters shall be liquidtight.

3.3 EQUIPMENT CONNECTION

A. As specified and as required to make for a completely operative system.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Branch circuit panelboards.

B. Distribution panelboards.

1.2 RELATED SECTIONS

1.3 REFERENCES

A. NECA (National Electrical Contractors Association) "Standard of Installation."

B. NEMA AB 1 - Molded Case Circuit Breakers.

C. NEMA KS 1 - Enclosed Switches.

D. NEMA PB 1 - Panelboards.

E. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

F. NFPA 70 - National Electrical Code.

G. UL 67 - Panelboards.

1.4 SUBMITTALS

A. Submit under provisions of Division 1 and Section 260511.

B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.5 RECORD DOCUMENTS

A. Record actual locations of Products; indicate actual branch circuit arrangement.

1.6 OPERATION AND MAINTENANCE DATA

A. Maintenance Data: Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and

intervals.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with NECA Standard of Installation.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.9 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish products listed and classified by UL as suitable for purpose specified and indicated.

1.10 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

1.11 MAINTENANCE MATERIALS

A. Provide two of each panelboard key.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Square D

B. General Electric

C. Siemens

D. Cutler-Hammer

2.2 PANELBOARDS

A. Panelboards: NEMA PB1, circuit breaker type.

B. Panelboard Bus: Tin plated copper, ratings as indicated. Provide copper ground bus in each panelboard; provide insulated ground bus where scheduled.

C. Minimum integrated short circuit rating, or as indicated on the Drawings. Panelboards shall have a fully-rated interrupting rating. Series-rated equipment will not be accepted.

D. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter

circuit breakers where scheduled. Do not use tandem circuit breakers. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.

E. Enclosure: NEMA PB 1, Type 1.

F. Cabinet box: 6 inches deep; width: 20 inches for 240 volt and less panelboards, 20 inches for 480 volt panelboards.

G. Cabinet Front: Surface cabinet front with concealed trim clamps, concealed hinge, and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

H. The use of multiple single-pole circuit breakers with wire ties or common trip plastic caps in lieu of single handle 2- and 3-pole circuit breakers is not acceptable.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards in accordance with NEMA PB 1.1.

B. Install panelboards plumb. Provide supports in accordance with Section 16190.

C. Height: 6 ft to top of panelboard; install panelboards taller than 6 ft with bottom no more than 4 inches above floor.

D. Provide filler plates for unused spaces in panelboards.

E. Provide typed or neatly handwritten circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.

F. Provide engraved plastic nameplates under the provisions of Section 16195.

G. Provide a minimum of four (4) spare 20A/1P circuit breakers in each branch circuit panelboard or as indicated on the drawings.

H. Install all screws and bolts in coverplates.

I. Install knockout plugs in all unused openings in enclosure.

J. Install nameplates on all circuit breakers of large panelboards.

K. Not used.

L. Panelboards installed on basement walls shall be installed on 1-1/2 inch channel.

M. The first section of multi-section panelboards shall have feed-through lugs. Contractor shall install conductors with ampacities equal to the bus rating of the panelboards, from the feed-through lugs to the main lugs only of Section #2 panelboard.

3.2 FIELD QUALITY CONTROL

A. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Wall switches.

B. Receptacles.

C. Device plates.

1.2 RELATED SECTIONS

1.3 REFERENCES

A. NEMA WD 1 - General Purpose Wiring Devices.

B. NEMA WD 6 - Wiring Device Configurations.

C. UL 20 - General Use Snap Switches.

D. UL 498 - Attachment Plugs and Receptacles.

E. UL 894 - Switches for Use in Hazardous (Classified) Locations.

F. UL 1010 - Receptacle Plug Combinations for Use in Hazardous (Classified) Locations.

1.4 SUBMITTALS

A. Submit under provisions of Division 1 and Section 260511.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

C. Manufacturer's Instructions:

1. Indicate application conditions and limitations of use stipulated by product testing agency specified under regulatory requirements.

2. Include instructions for storage, handling, protection, examination, preparation, operation and installation of product.

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.6 EXTRA MATERIALS

A. Provide protective rings and split nozzles as required and as specified.

PART 2 - PRODUCTS

2.1 WALL SWITCHES

A. Single Pole Switch:

1. Hubbell #1221.

2. Pass & Seymour #20AC1.

3. Arrow-Hart #1991.

B. Double Pole Switch:

1. Hubbell #1222.

2. Pass & Seymour #20AC2.

3. Arrow-Hart #1992.

C. Three-way Switch:

1. Hubbell #1223.

2. Pass & Seymour #20AC3.

3. Arrow-Hart #1993.

D. Four-way Switch:

1. Hubbell #1224.

2. Pass & Seymour #20AC4.

3. Arrow-Hart #1994.

2.2 RECEPTACLES (Heavy Duty, Specification Grade)

A. Single Convenience Receptacle:

1. Hubbell #5361.

2. Pass & Seymour #5361.

3. Arrow-Hart #5361.

B. Duplex Convenience Receptacle:

1. Hubbell #5362.

2. Pass & Seymour #5362.

3. Arrow-Hart #5362.

C. GFCI Receptacle:

1. Hubbell #GF5352.

2. Pass & Seymour #2091.

3. Arrow-Hart #GF5342.

D. Isolated Ground Duplex Receptacle:

1. Hubbell #IG5362.

2. Pass & Seymour #IG6300.

3. Arrow-Hart #IG5362.

E. Special Purpose Receptacle:

1. Type, NEMA configuration and voltage as specified on Drawings as manufactured by:

a. Hubbell.

b. Pass & Seymour.

c. Arrow-Hart.

F. Color of devices as selected by Architect/Engineer.

2.3 WALL PLATES

A. Cover Plates:

1. High impact smooth nylon in all areas except where specifically noted otherwise. Color shall be selected by the Architect.

2. Stainless steel in all mechanical, electrical, and equipment rooms and any unfinished spaces.

B. Weatherproof Enclosures:

1. Receptacles in wet locations shall be installed with an outlet enclosure clearly marked "Suitable for Wet Locations While in Use." There shall be a gasket between the enclosure and the mounting surface, and between the cover and the base to assure proper seal.

2. The enclosure must employ stainless steel mounting hardware and be constructed of impact resistant polycarbonate. The outlet enclosure shall be UL listed, TayMac Corporation #MM400GY-B, or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify conditions.

B. Verify outlet boxes are installed at proper height.

C. Verify wall openings are neatly cut and will be completely covered by wall plates.

D. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

E. Verify color of all devices and coverplates prior to ordering or purchase.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean debris from outlet boxes.

3.3 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install devices plumb and level. Coverplates shall be snug to wall on all four sides, but not overly tightened to cause center depression.

C. Install switches with OFF position down.

D. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.

E. Install plates on switch, receptacle, and blank outlets in all areas. Install cover plate on all unused boxes.

F. Connect wiring devices by wrapping conductor around screw terminal.

G. Use jumbo size plates for outlets installed in masonry walls.

H. Install galvanized steel plates on outlet boxes and junction boxes above accessible ceilings, and on surface mounted outlets.

I. All plates shall be secured by means of screws with heads matching coverplates.

J. Receptacles shall be installed with equipment grounds down, unless local codes require otherwise. Regardless, all receptacles, including GFI receptacles, shall be

installed in the same way with the ground, turned in the same direction.

3.4 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations of outlet boxes provided under Section 16130 to obtain mounting heights specified and indicated on Drawings.

B. Install wall switch 48 inches above finished floor.

C. Install convenience receptacle 18 (vertically oriented) inches above finished floor unless noted otherwise on Drawings.

D. Install convenience receptacle 6 (horizontally oriented) inches above counter. Coordinate with Architect as to counter height.

E. Install data and telephone outlets 18 (vertically oriented) inches above finished floor.

F. Install fire alarm audio and/or visual devices 6'-8" above finished floor, or 6 inches below finish ceiling, whichever is lower.

G. Install fire alarm pull station 44” above finished floor.

3.5 FIELD QUALITY CONTROL

A. Inspect each wiring device for defects.

B. Operate each wall switch with circuit energized and verify proper operation.

C. Verify that each receptacle device is energized.

D. Test each receptacle device for proper polarity.

E. Test each GFCI receptacle device for proper operation.

F. Replace any device or correct installation for any device that fails testing.

3.6 ADJUSTING

A. Adjust devices and wall plates to be flush and level and fit snug to wall.

END OF SECTION

SECTION 26 27 28

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Nameplates and labels.

B. Wire and cable markers.

1.2 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

1.3 SUBMITTALS

A. Submit under provisions of Division 1 and Section 260511.

B. Product Data: Provide catalog data for nameplates, labels, and markers.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation and installation of Product.

1.4 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.1 NAMEPLATES AND LABELS

A. Nameplates: Engraved three-layer laminated plastic, white letters on black background.

B. Locations:

1. Each electrical distribution equipment (panelboards, transformers) and control equipment enclosure (starters, disconnect switches, etc.).

C. Letter Size:

1. Use 1/2 inch letters for identifying equipment designation and voltage.

D. Provide typewritten directory in each panelboard of circuit designations in clear/ transparent protective envelope attached to inside of panelboard door.

2.2 WIRE MARKERS

A. Description: Tape or tubing type wire markers.

B. Locations: Each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection.

C. Legend:

1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.

2.3 TRENCH TAPE

A. Tape shall be detectable aluminum foil polyethylene laminate.

B. Tape shall be the following color and have the following wording:

Application	Color	Caution Wording
Cable TV	Orange	“Caution - Cable TV Line Buried Below”
Electrical	Red	“Caution - Electric Line Buried Below”
Telephone	Orange	“Caution - Telephone Line Buried Below”
Fiber Optic	Orange	“Caution - Buried Fiber Optic Cable”

C. Tape shall be equal to Panduit Type HTDU.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive nameplates and labels.

3.2 APPLICATION

A. Install nameplate and label parallel to equipment lines.

B. Secure nameplate to equipment front using No. 4 round heat cadmium plated, steel self-tapping screws or nickel-plated brass plates.

C. Identify underground conduits using underground warning tape. Install one tape per trench at 6 inches below finished grade.

D. All fire alarm junction boxes, pullboxes and covers shall be painted red.

E. Both ends of pullwires shall be identified by means of labels or tags, reading "PULLWIRE" and shall be numbered to refer to same pullwire.

F. Install nameplates at each circuit breaker on all switchboards and large panelboards.

END OF SECTION

SECTION 26 51 10

INTERIOR LUMINAIRES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Interior luminaires and accessories.

B. Exit signs.

C. Ballasts.

D. Lamps.

E. Luminaire accessories.

1.2 RELATED SECTIONS

1.3 REFERENCES

A. ANSI C78.379 - Electric Lamps - Incandescent and High-Intensity Discharge Reflector Lamps - Classification of Beam Patterns.

B. ANSI C82.1 - Ballasts for Fluorescent Lamps - Specifications.

C. ANSI C82.4 - Ballasts for High-Intensity Discharge and Low Pressure Sodium Lamps (Multiple Supply Type).

D. ANSI/NFPA 70 - National Electrical Code.

E. ANSI/NFPA 101 - Life Safety Code.

F. UL 924 - Emergency Lighting and Power Equipment.

G. UL 1570 - Fluorescent Lighting Features.

H. UL 1571 - Incandescent Lighting Fixtures.

I. UL 1572 - High Intensity Discharge Lighting Fixtures.

1.4 SUBMITTALS

A. Submit under provisions of Division 1 and Section 260511.

B. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

C. Product Data: Provide dimensions, ratings, and performance data.

D. Manufacturer's Instructions: Include instructions for storage, handling, protection,

examination, preparation, and installation of product.

1.5 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of each luminaire.

1.6 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Division 1 and Section 260511.

B. Maintenance Data: Include replacement parts list.

1.7 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Conform to requirements of NFPA 101.

C. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.1 LUMINAIRES

A. Furnish products as specified on Drawings.

B. Install ballasts, lamps, and specified accessories at factory.

2.2 EXIT SIGNS

A. Manufacturers: As scheduled on Drawings.

B. Description: Exit sign fixture.

C. Housing: High impact thermoplastic unless scheduled otherwise on Drawings.

D. Face: As scheduled on Drawings.

E. Directional Arrows: As indicated on Drawings.

F. Mounting: As indicated on Drawings.

G. Battery: As scheduled on Drawings.

H. Battery Charger: Dual-rate type, with sufficient capacity to recharge discharged battery to full charge within twelve hours.

I. Lamps: Manufacturers standard LED lamps.

J. Input Voltage: 120/208/277/480 volts (multi-volt).

2.3 BALLASTS

A. Fluorescent Ballast:

1. Description: ANSI C82.11, C62.41 Category A, high power factor, programmed-start (PS) electronic type, less than 10 percent harmonic distortion, with resetting thermal protectors, equal to Advance Mark V.

2. Provide ballast suitable for lamps specified.

3. Voltage: Match luminaire voltage.

4. Source Quality Control: Certify ballast design and construction by Certified Ballast Manufacturers, Inc. Sound level shall be Class A.

B. H.I.D. Ballasts

1. Lower wattage HID's (0-175W): Shall be electronic, high power factor (HPF) type, THD of <15%, thermally & transiently protected, shut-down circuit at end of lamp life, sound rating "A", -5 degrees F minimum starting temperature.

2. Higher wattage HID's (250W and greater): Shall be constant wattage autotransformer type (CWA), high power factor (HPF).

3. Indoor locations shall be encapsulated.

C. Emergency Ballasts:

1. All emergency ballasts for one or two lamp operation shall be equal to Bodine B-50 with a 5 year warranty (not pro-rata).

2. All emergency ballasts shall meet UL 924.

2.4 LAMPS

A. Fluorescent Lamp Manufacturers:

1. Osram/Sylvania.

2. Phillips.

3. General Electric.

B. Provide lamp type specified for luminaire.

C. Fluorescent lamps shall be of the low mercury type.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrate and supporting grids for luminaires.

B. Examine each luminaire to determine suitability for lamps specified.

3.2 INSTALLATION

A. Install in accordance with manufacturers instructions.

B. Support luminaires larger than 2 x 4 foot size independent of ceiling framing.

C. Locate recessed ceiling luminaires as indicated on Architectural reflected ceiling plan.

D. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prohibit movement.

E. Exposed Grid Ceilings: Fasten surface mounted luminaires to ceiling T using bolts, screws, rivets, or suitable clips.

F. Install recessed luminaires to permit removal from below. Final connections to lay-in light fixtures shall be made with 6'-0" flexible conduit.

G. Gyp board ceilings with a fire rating: Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating at ceiling.

H. Install clips to secure recessed grid-supported luminaires in place.

I. Install wall mounted luminaires, emergency lighting units and exit signs at height as indicated on Drawings as scheduled.

J. Install all accessories furnished with each luminaire or as required for a complete installation as indicated.

K. Connect luminaires, emergency lighting units and exit signs to outlet boxes provided under Section 16130.

L. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

M. Bond products and metal accessories to branch circuit equipment grounding conductor.

N. Install specified lamps in each luminaire, emergency lighting unit and exit sign.

O. All fixtures shall be guaranteed for a period of one year after final acceptance and any defects in material or workmanship during this period shall be replaced or repaired to the Engineer's satisfaction without extra cost.

P. All supports, safety chains, swivels, etc. shall be furnished as required for a complete installation.

Q. Securely fasten all exit signs to surface to which they are mounted.

R. Replace all broken or cracked lens.

S. Replace all scratched or bent reflectors and door frames.

T. Light fixtures shall not be supported by lay-in ceilings. Light fixtures shall be independently supported to the building structure.

U. Light fixtures shall not be supported from conduits, duct or piping.

V. All recessed light fixtures shall have seismic clips firmly situated over tops of ceiling grid tees or plaster rings.

W. All light fixtures that weigh more than 50 pounds shall have a safety chain or safety cable attached to building structure in addition to its other support.

3.3 FIELD QUALITY CONTROL

A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

B. Turn off circuit breakers serving emergency self-contained ballasts and self-contained exit signs to verify that emergency lighting is working properly.

3.4 ADJUSTING

A. Aim and adjust luminaires as indicated on Drawings or as directed.

B. Set exit sign directional arrows as indicated on drawings.

C. Relamp luminaires that have failed lamps at Substantial Completion. Fluorescent lamps that fail within the first 90 days of operation will be considered defective and shall be replaced at no extra cost.

3.5 CLEANING

A. Clean electrical parts to remove conductive and deleterious materials.

B. Remove dirt and debris from enclosure.

C. Clean photometric control surfaces as recommended by manufacturer.

D. Clean finishes and touch up damage.

E. Clean interior face of all lens fixtures upon project completion.

END OF SECTION

1.04 TESTING AND INSPECTION: EMPLOY AT CONTRACTOR'S EXPENSE, A TESTING LABORATORY THAT MEETS ASTM D-3666 FOR ASPHALT, ASTM D-3740 FOR SOILS AND ASTM C-1077 FOR CONCRETE, ACCEPTABLE TO THE ARCHITECT TO PERFORM SOIL TESTING AND INSPECTION SERVICE FOR QUALITY CONTROL DURING EARTHWORK AND SITE GRADING OPERATIONS. GRUBBS, HOSKYN, BARTON & WYATT, INC. IS AN APPROVED TESTING AND INSPECTION LABORATORY. ALL OTHERS MUST BE PRE-BID APPROVED AND SUBMITTED IN COMPLIANCE WITH SECTION 01300.

1.05 PROJECT CONDITIONS:

1. Site Information:
   a. Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly understood that the Owner will not be responsible for interpretations or conclusions drawn therefrom by Contractor. Data is made available for the convenience of the Contractor. Additional test borings and other exploratory operations may be made by Contractor at no cost to Owner.
2. Existing Utilities:
   a. Locate existing underground utilities in the area of work. Provide adequate means of protection during earthwork operations. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult the utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
   b. Do not interrupt existing utilities servicing facilities, except when permitted in writing by Architect and then only after acceptable temporary utility services have been provided.
3. Use of Explosives: Use of explosives will not be permitted.
4. Protection: Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement undermining, washout and other hazards created by earthwork operations.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS:

1. Sub-base Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, natural or crushed sand, as acceptable to the Architect.
2. Drainage Fill: Washed, uniformly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100% passing a No. 1-1/2 sieve and not more than 5% passing a No. 4 sieve.
3. Select Backfill and Fill Materials: Select clayey sand or sandy clay having liquid limit of less than 40, or other approved fill. Fill soils classifying as SC or GC according to Unified Soils Classification System are suitable.

2.02 SUBSURFACE INFORMATION:

1. It shall be the Bidder’s sole responsibility to estimate the type and quantity of materials and the amount of groundwater, if any, which will be encountered.
2. Information derived from inspection of topographic maps, or from plans showing location of utilities and structures will not relieve the contractor from any risk, or from properly examining the site and making such additional investigations as he may elect, or from properly fulfilling all the terms of the contract documents.
3. The submission of a proposal shall be conclusive evidence that the Bidder has investigated the site and is satisfied as to the conditions to be encountered, as to the character, quality and quantities of work to be performed and materials to be furnished, and as to the requirements of the contract documents.

2.03 UNCLASSIFIED EXCAVATION:

1. Complete all excavation regardless of the type, nature or condition of the materials encountered.
2. The contractor shall make his own estimate of the kind and extend of the various materials to be excavated in order to accomplish the work.
3. All excavation shall be classified as unclassified excavation.

2.04 SELECT FILL MATERIAL:

1. Native or imported material free from roots, organic matter, trash, debris, with maximum particle size of 3-1/2”.

2. Material shall have plasticity with a maximum plasticity index (PI) of 30 and shall be classified as a (GC) material.

2.05 COMPACTION EQUIPMENT:

1. Provide compaction equipment of suitable type and adequate to obtain the densities specified.
2. Operate compaction equipment in strict accordance with the manufacturer's instructions and recommendations.
3. Hand-operated equipment shall be capable of achieving the specified densities.

2.06 MOISTURE CONTROL EQUIPMENT:

1. Provide equipment for applying water of a type and quality adequate for the work; it shall not leak; and be equipped with a distributor bar or other approved device to assure uniform application.
2. Provide equipment for mixing and drying out material consisting of blades, discs, or other approved equipment.

2.07 WATER REMOVAL EQUIPMENT: PROVIDE AND OPERATE EQUIPMENT ADEQUATE TO KEEP EXCAVATION AND TRENCHES FREE OF WATER.

2.08 IMPORTED MATERIAL ACCEPTANCE:

1. Import only if insufficient material is available on-site.
2. Locate and arrange use of a site near the construction area for obtaining borrow material.
3. Additional tests required at the borrow area:
   a. Modified Proctor
   b. Gradation Tests
   c. Atterberg Limits
4. Upon completion of removal of borrow material, grade the site to drain, place topsoil on disturbed areas, and establish grass.
5. Costs shall be the responsibility of the Contractor.

2.09 SELECTED MATERIAL ACCEPTANCE:

1. Provide samples for testing representative of the actual material to be installed in the work. Take samples from each 2,000 cubic yards of material stockpiled. Depending on the uniformity of the material, Design Professional may request more frequent samples.
2. Forward test results to the Design Professional at least 10 days before the material is required for use. If tests indicate that the material does not meet specification requirements, the material shall not be installed in the work.
3. Material which is placed in the work, but does not conform to the specification requirements, shall be removed and replaced at the Contractor's sole expense.

PART 3 - EXECUTION

3.01 UNCLASSIFIED EXCAVATION:

1. Perform all excavation of every description, regardless of the type, nature or condition of material encountered, as specified, shown, or required to accomplish the construction.
2. The method of excavation used is optional; however, no equipment shall be operated within 5' of the existing structures or newly completed construction.
3. Excavation that cannot be accomplished without endangering the existing trees or new structures shall be performed with hand tools.

3.02 EXCAVATION:

1. The Contractor shall be solely responsible for making the excavation in a safe manner.
2. Provide appropriate measures to retain excavation side slopes to ensure that men working in or near the excavation are protected.
3. The Contractor shall be solely responsible for trench and excavation safety systems in accordance with Act 291 of 1993 of the State of Arkansas and OSHA 29 CFR 1926 Subpart P requirements.
4. Classification: Remove and dispose of any material encountered to obtain required subgrade elevations, including pavement, obstructions visible on ground surface, underground structures including, but not limited to abandoned stream tunnel, and utilities indicated to be removed, boulders, solid rock, rock in ledges, and rock-hard cementitious aggregate deposits. Correct

unauthorized excavations (removal of materials beyond indicated subgrade elevations) by extending the indicated bottom elevation of the footing to the lower elevation.

5. Shoring and Bracing: Provide materials for shoring and bracing such as sheet piling, uprights, stringers and cross-braces, in good serviceable condition.
6. Dewatering: Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrade and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations. Convey water removed from excavations and rainwater to collecting or runoff areas. Establish and maintain temporary drainage ditches and other diversions outside excavation limits for each structure. Do not use trench excavations as temporary drainage ditches.
7. Material Storage: Stockpile excavated materials where directed until required for backfill and fill. Place, grade, and shape stockpiles for proper drainage. Locate on site or as directed by Owner or Architect, and retain soil materials away from edge of excavations. Dispose of excess soil and material as specified.
8. Excavation for Structure: Excavate for structure to elevations and dimensions shown, extending excavation a sufficient distance to permit placing and removal of concrete formwork, installation of services, other work, and for inspection. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottom to required lines and grades to provide solid base to receive concrete.
    a. After required excavation, proof-roll site with minimum 20,000 lb. pneumatic-tired roller, loaded tri-axle dump truck, or similar equipment. Remove soft and organic-containing soil, miscellaneous debris, and roots. Fill and compact areas.
    b. Include, in base bid, provisions for undercut, fill and compaction of cubic yards.
    c. Unit prices, as set forth in Bid Form, will apply for undercutting quantities greater or less than those stated above. Provide for observation of geotechnical engineer to assess adequacy of bearing stratum. If observation indicates excessively soft and/or organic-containing soils, then undercut, fill and compact areas and/or extend footings as directed by geotechnical engineer. Quantities must be substantiated by geotechnical engineer. Quote cubic yard prices for completed work including undercutting, fill, compaction, and concrete. Prices quoted include full compensation for labor, materials, tools, equipment, and other necessary items for complete installation. All other undercutting to meet requirements of contract documents and to be included in base bid.
9. Excavation for Pavements: Cut surface under pavements to comply with cross-sections, elevations and grades as indicated.
10. Excavation for Trenches: According to ACT 291, dig trenches to the uniform width required for the particular item to be installed, sufficiently wide to provide ample working room, and to the depth indicated or required. Carry the depth of trenches for piping to establish the indicated flow lines and invert elevations. Beyond the building perimeter, keep bottoms of trenches sufficiently below finish grade to avoid freeze-ups. Where rock is encountered, carry the excavation 6" below the required elevation and backfill with a 6" layer of crushed stone or gravel prior to installing pipe. Grade bottoms of trenches as indicated, notching under pipe bells to provide solid bearing for the entire body of pipe. Backfill trenches with concrete where trench excavations pass within 18" of column or wall footings and which are carried below bottom of such footings, or which pass under wall footings. Place backfill to level of bottom of adjacent footing. Do not backfill trenches until tests and inspections have been made and backfilling authorized by Architect. Use care in backfilling to avoid damages or displacement of pipe systems.

3.03 DEWATERING EXCAVATION:

A. Remove water during periods when placing of backfill unless water settling is required, and at other times as required for efficient and safe execution of the work.

B. Accomplish removal of groundwater in a manner that will preserve the strength of the foundation soils, will not cause instability of the excavation slopes, and will not result in damage to existing structures.

C. Arrange discharge to facilitate collection of samples by engineer.
   1. Avoid settlement or damage to adjacent property.
   2. Dispose of water in a manner that will not damage adjacent property, as approved.

3.04 SELECT FILL:

1. Place select fill to the lines and grades shown.
2. Place fill material in maximum 8” loose lifts and compact each lift to not less than 95% Modified Proctor.

B. MOISTURE CONTROL:
   1. During compacting operations, maintain optimum practicable moisture content required for compaction purposes in each lift of fill.
   2. Maintain moisture content uniform throughout the lift.
   3. Add water to the material at the site of excavation. Supplement, if required, by sprinkling the fill.
   4. At the time of compaction, maximum water content of the material is to be within +3% or –2% of optimum.
   5. Do not attempt to compact fill material that contains excessive moisture.
   6. Aerate material by blading, discing, harrowing or other methods, to hasten the drying process.

C. FIELD DENSITY TESTS:
   1. Test Methods: ASTM D 2922, D 1556, D 2216 and D 3017.
   2. Cooperate with testing work by leveling small test areas designated by the Design Professional.
   3. Backfill test areas.
   4. Field density tests shall be performed for every 500 cubic yards or 1,800 square yards per lift of fill material placed.
   5. Design Professional may order testing of lift of fill at any time, location or elevation.

D. SITE GRADING:
   1. Perform earthwork to lines and grades as shown on drawings.
   2. Shape, trim and finish slopes to conform with the lines and grades shown.
   3. Finished slopes shall be free of loose exposed roots and stones exceeding 2” diameter.
   4. Round tops of banks to circular curbs, in general, not less than a 6’ radius.
   5. Neatly and smoothly trim rounded surfaces; over-excavating and backfilling to the proper grade are not acceptable.
   6. Finished site grading shall be reviewed by the Design Professional.

E. DISPOSAL OF EXCESS EXCAVATION:
   1. Dispose of excess excavated materials, not required or suitable for use as backfill or fill, outside of the area of work.
   2. Compact excess material as specified for fill, dress the completed disposal area to slopes no greater than 4:1 (horizontal: vertical), and slope to drain.

F. SETTLEMENT: Settlement in backfill or fill that may occur within the one-year guarantee period in the General Conditions, shall be considered to be caused by improper compaction methods.

G. BACKFILL AND FILL: Place and compact acceptable soil material in layers to required elevations. Backfill excavations as promptly as work permits. Place backfill and fill materials in layers not more than 8" in loose depth, compacting each layer to required maximum density. Do not place materials on surfaces that are muddy, frozen, or contain ice or frost.

H. COMPACTION: Compact soils to not less that the following percentages of maximum Modified Proctor density for soils which exhibit a well-defined moisture density relationship determined in accordance with ASTM D1557.
   1. As directed by Geotech. Engineer
   2. At lawns or unpaved areas, compact the top 6" to 90% maximum density.

I. PAVEMENT SUBBASE COURSE: Place specified sub-base material in layers of indicated thickness, over subgrade surface to support walks and pavement. Place in single layer for courses 6" thick or less and equal layers for courses more than 6" thick.

J. BUILDING SLAB DRAINAGE COURSE: Place drainage fill material on prepared subgrade in single layer for course 6" thick or less and equal layers for courses more than 6" thick.

K. GRADING: Subgrade elevation to be 4" to 6" below finish indicated for placement of topsoil as indicated in Landscape Seeding and Sodding. Grade areas indicated with uniform levels or slopes between finish elevations. Shape surface of areas to 0.10 ft. above or below required subgrade elevation, compacted as required.

L. MAINTENANCE: Repair and re-establish grades in settled, eroded, rutted or otherwise damaged areas. In damaged compacted areas, scarify the surface, re-shape, and compact to required density prior to further construction.

END OF SECTION 31 10 00

SECTION 31 22 00
GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of topsoil.

B. Rough grading the site for site structures.

C. Finish grading.

1.02 RELATED REQUIREMENTS

A. Section 31 23 16.13 - Trenching: Trenching and backfilling for utilities.

B. Section 31 23 23 - Fill: Filling and compaction.

C. Section 32 92 19 - Seeding: Finish ground cover.

PART 2 PRODUCTS

2.01 MATERIALS

A. Topsoil: Topsoil excavated on-site.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

B. Verify the absence of standing or ponding water.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Stake and flag locations of known utilities.

C. Provide temporary means and methods to remove all standing or ponding water from areas prior to grading.

3.03 ROUGH GRADING

A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.

B. Do not remove topsoil when wet.

C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.

D. Do not remove wet subsoil , unless it is subsequently processed to obtain optimum moisture content.

E. When excavating through roots, perform work by hand and cut roots with sharp axe.

F. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

G. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack surface water control.

3.04 SOIL REMOVAL

A. Stockpile excavated topsoil on site.

B. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet; protect from erosion.

3.05 FINISH GRADING

A. Before Finish Grading:
   1. Verify building and trench backfilling have been inspected.
   2. Verify subgrade has been contoured and compacted.

B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.

C. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches.

D. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.

E. Maintain stability of topsoil during inclement weather. Replace topsoil in areas where surface water has eroded thickness below specifications.

3.06 FIELD QUALITY CONTROL

A. See Section 31 23 23 for compaction density testing.

END OF SECTION 31 22 00

SECTION 32 13 13
CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete sidewalks, integral curbs, and gutters.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 07 92 00 - Joint Sealants: Sealing joints.

C. Section 31 22 00 - Grading: Preparation of site for paving and base and preparation of subsoil at pavement perimeter for planting.

D. Section 32 17 23 - Pavement Markings.

1.03 REFERENCE STANDARDS

A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).

B. ACI 301 - Specifications for Structural Concrete; 2016.

C. ASTM C150/C150M - Standard Specification for Portland Cement; 2021.

D. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2019.

1.04 SUBMITTALS

A. Design Data: Indicate pavement thickness, designed concrete strength, reinforcement, and typical details.

PART 2 PRODUCTS

2.01 PAVING ASSEMBLIES

A. Comply with applicable requirements of ACI 301.

B. Design paving for parking and light duty commercial vehicles.

C. Concrete Sidewalks and Median Barrier: 3,000 psi 28 day concrete, 4 inches thick, buff color Portland cement, exposed aggregate finish.

D. Parking Area Pavement: 4,000 psi 28 day concrete, 5 inches thick, 6 by 6 - W2.9 by W2.9 mesh reinforcement, wood float finish.

2.02 FORM MATERIALS

A. Wood form material, profiled to suit conditions.

2.03 REINFORCEMENT

2.04 CONCRETE MATERIALS

A. Obtain cementitious materials from same source throughout.

B. Concrete Materials: As specified in Section 03 30 00.

C. Cement: ASTM C150/C150M, Normal - Type I Portland cement, gray color.

D. Fly Ash: ASTM C618, Class C or F.

E. Water: Clean, and not detrimental to concrete.

2.05 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.

B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience, as specified in ACI 301.

C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.

2.06 MIXING

PART 3 EXECUTION

3.01 SUBBASE

3.02 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient.

3.03 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Ensure reinforcement, inserts, embedded parts, formed joints and ____ are not disturbed during concrete placement.

3.04 JOINTS

3.05 FINISHING

A. Sidewalk Paving: Light broom, texture perpendicular to direction of travel with troweled and radiused edge 1/4 inch radius.

B. Curbs and Gutters: Light broom, texture parallel to pavement direction.

3.06 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

1. Provide free access to concrete operations at project site and cooperate with appointed firm.

END OF SECTION 32 13 13

SECTION 32 13 15
CONCRETE CURB, GUTTERS AND SIDEWALKS

PART 1 - GENERAL

1.01 SCOPE: THIS SECTION COVERS THE FOLLOWING CONCRETE ITEMS:

A. Extruded cast-in-place concrete curb and gutters

B. Sidewalks

C. Mechanical pads

1.02 RELATED ITEMS:

A. Crushed stone base course; Section 02232.

B. Portland cement concrete paving; Section 02520.

C. Cast-in-place concrete; Section 03300.

PART 2 - PRODUCTS

2.01 MATERIALS: CONCRETE MATERIALS, FORMS, REINFORCING, AND APPURTENANT MATERIALS ARE SPECIFIED IN SECTIONS 02520 AND SECTION 03300.

PART 3 - EXECUTION

3.01 PREPARATION:

A. The sub-grade and base course shall be prepared as specified in Section 02232.

B. Preparation shall be complete before form work and concrete placement is begun.

C. The areas where wheels or tracks of the curb and gutter extrusion machine will run shall also be prepared to the extent that the machine operation will produce the required lines and grades.

3.02 EXTRUDED CURB AND GUTTER:

A. Concrete curb and gutter shall be constructed by the extrusion method.

B. Machine placement shall produce curb and gutters to the cross-section lines, grades, finishes and jointing indicated on the drawings and as specified for formed concrete.

C. Curb and gutter placement shall not begin until all base course and sub-grade areas where the extrusion machine will run have been adequately prepared.

D. The extrusion machine shall be controlled by experienced personnel.

E. The finished curb and gutter shall not vary from the lines and grades indicated on the drawings.

F. The lines of the section shall not be wavy in appearance.

G. The maximum deviation in any plane when measured by a taut string line, shall be less than 1/2" in 10 feet.

3.03 SIDEWALKS AND MECHANICAL PADS:

A. Sidewalks shall be constructed to the lines, grades, dimensions, and details indicated on the drawings.

B. Sidewalks shall be formed.

C. In locations where there is both sidewalk and curb and gutter, the curb and gutter shall be placed first.

D. The sidewalk shall be finished to an elevation that provides positive drainage to the curb and gutter.

E. Following the placement of the sidewalk, topsoil shall be placed in the strip between the sidewalk and the curb and gutter, and compacted to preclude settlement.

FINISH ON SIDEWALKS:

A. ADA Warning Finishes: Truncated domes shall have a diameter of 0.9 inch at the bottom, a diameter of 0.4 inch at the top, a height of 0.2 inch and a center-to-center spacing of 2.35 inches measured along one side of a square arrangement.

B. Other Areas: Broom finish.

END OF SECTION 32 13 15

SECTION 32 17 23
PAVEMENT MARKINGS

PART 1 GENERAL

1.01 SCOPE: THIS SECTION COVERS TRAFFIC SIGNAGE, INCLUDING PAVEMENT MARKINGS AND TRAFFIC SIGNS.

1.02 SECTION INCLUDES

1.03 QUALITY ASSURANCE: ADEQUATE EQUIPMENT AND QUALIFIED PERSONNEL SHALL BE USED ON THIS PHASE OF THE WORK.

A. Painted pavement markings.

1.04 REGULATORY REQUIREMENTS: ALL TRAFFIC SIGNAGE SHALL BE IN ACCORDANCE WITH THE ARKANSAS HIGHWAY AND TRANSPORTATION DEPARTMENT.

1.05 RELATED REQUIREMENTS

A. Section 32 12 16 - Asphalt Paving.

B. Section 32 13 13 - Concrete Paving.

PART 2 PRODUCTS

2.01 PAINTED PAVEMENT MARKINGS

A. Painted Pavement Markings: As indicated on drawings.
   1. The paint shall be a non-bleeding, quick-drying, alkyd petroleum based paint suitable for traffic bearing surface and shall meet FS TTP-85E and mixed in accordance with manufacturer's instructions before application.

2.02 REFERENCE STANDARDS

2.03 DELIVERY, STORAGE, AND HANDLING

2.04 SIGNS:

A. Store products in manufacturer's unopened packaging until ready for installation.

B. "HANDICAPPED PARKING" Signs -: Signs will be furnished by Contractor. Contractor will be responsible for furnishing posts, hardware and installation of these signs. As shown on drawings.

2.05 FIELD CONDITIONS

PART 3 EXECUTION

3.01 INSTALLATION

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. General:
   1. Position pavement markings as indicated on drawings.

C. Painted Pavement Markings:
   1. Apply in accordance with manufacturer's instructions.
   2. Apply two coats of paint at manufacturer recommended rate without the addition of thinner, with a maximum of 100 sq. ft. per gallon. Apply with mechanical equipment to produce uniform straight edges.

3.02 FIELD QUALITY CONTROL

A. Allow the pavement marking to set at least the minimum time recommended by manufacturer.

B. SIGN INSTALLATION: Install posts in 18" round x 24" deep concrete foundations. Set posts vertical and plumb with bottom of sign at 6'-5" above finish grade. Mount signs in accordance with manufacturer's instructions.

END OF SECTION

4.01 PREPARATION

A. Clean surfaces prior to installation.
   1. Remove dust, dirt, and other debris.
   2. Field location adjustments require approval of Architect.

B. See Section 01 40 00 - Quality Requirements for additional requirements.

4.02 PROTECTION

A. Replace damaged or removed markings at no additional cost to Owner.

SECTION 32 91 20
LANDSCAPING

PART 1 - GENERAL

1.01 SCOPE: PROVIDE LANDSCAPE DEVELOPMENT WORK, COMPLETE.

1.02 SUBMITTALS: COMPLY WITH SECTION 01300.

A. Submit planting schedule showing scheduled dates for each type of planting.

B. Maintenance Instructions: Submit recommended procedures to be established by Owner for maintenance of landscape work for one full year, complete, including watering, fertilizing, and pruning. Submit prior to expiration of required maintenance period.

1.03 PRODUCT DELIVERY: NOTIFY ARCHITECT OF DELIVERY SCHEDULE IN ADVANCE. PLANT MATERIAL MAY BE INSPECTED UPON ARRIVAL AT JOB SITE. REMOVE UNACCEPTABLE PLANT MATERIAL FROM JOB SITE IMMEDIATELY.

1.04 JOB CONDITIONS:

A. Examine subgrade, verify elevations, and observe conditions under which work is to be performed. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Proceed with and complete landscape work as rapidly as portions of site become available, working within seasonal limitations for each kind of landscape work required.

C. Utilities: Determine location of underground utilities and perform work in a manner that will avoid possible damage. Hand excavate, as required, to minimize possibility of damage to underground utilities. Maintain grade stakes set by others until removal is mutually agreed upon by all parties concerned.

D. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Architect before planting.

E. Planting Time: Plant or install materials during normal planting seasons for each type of landscape work required, unless otherwise accepted.

1.05 GUARANTEE:

A. Guarantee lawns for one year following final acceptance.

B. Guarantee plant materials for one year following final acceptance. Guarantee against defects including death and unsatisfactory growth, except for defects resulting from neglect by Owner, abuse or damage by others, or losses due to curtailment of water by local authority.

C. Plant Removal and Replacement: Provide replacement plants complying with requirements indicated and specified. Replacement plants must be of the same size as original plants.

PART 2 - PRODUCTS

2.01 TOPSOIL:

A. Use stockpiled topsoil in landscape work. If quantity of stockpiled topsoil is insufficient, provide additional topsoil as required to complete landscape work. Condition existing topsoil as necessary, to provide topsoil meeting requirements specified for new topsoil.

B. New Topsoil: Fertile, friable, natural loam, surface soil free of noxious weeds and other litter, and free of roots, stumps, and stones larger than 2" in any dimension. Obtain topsoil from local sources or from areas having similar soil characteristics to that found at project site. Obtain topsoil only from naturally, well-drained sites where topsoil occurs in a depth of not less than 4". Do not obtain from bogs or marshes.

C. General Contractor to provide a minimum of 4” of topsoil at all disturbed areas prior to any seeding or sodding.

2.02 SOILS AMENDMENTS: PROVIDE LIME, PEAT MOSS, FERTILIZER, AND OTHER AMENDMENTS AS REQUIRED FOR PLANTING SOIL MIXTURE.

2.03 PLANTING SOIL MIXTURE:

A. Before mixing, clean stockpiled topsoil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful or toxic to plant growth.

B. Provide mixture in ratio of 3 parts topsoil, 1 part peat moss and 1 part sand. Add amendments as required.

2.04 PLANT AND LAWN MATERIALS:

A. Lawns: Cynodon dactylon, common Bermuda.
   1. Grass Seed All Other Disturbed Areas with Common Bermuda: Fresh, clean, dry new-crop seed with minimum 98% pure seed and 85% germination by weight, and containing no more than 1% weed seeds.

2.05 TREES AND SHRUBS: AS INDICATED ON DRAWINGS

PART 3 - EXECUTION

3.01 PREPARATION: LOOSEN SUBGRADE AND SPREAD PLANTING MIXTURE TO MINIMUM DEPTH REQUIRED TO MEET GRADES AND ELEVATIONS INDICATED. EXCAVATE PITS/BEDS/TRENCHES FOR TREES, SHRUBS, AND GROUND COVER.

3.02 PLANTING:

A. Sodded Lawns: Lay sod within 24 hours of stripping. Lay sod at right angles to slopes or flow of water. On sloped areas, start sod at bottom of slope. Lay to form a solid mass with tightly fitted joints. Butt ends of sod strips, do not overlap, and stagger to offset joints in adjacent courses. Tamp or roll lightly to ensure contact with subgrade. Work sifted soil into minor cracks between pieces of sod. Peg sod on slopes as required to prevent slippage. Water thoroughly immediately after planting.

B. Reconditioning Existing Lawns:
   1. Recondition existing lawn areas damaged by construction operations, including storage of materials and equipment and movement of vehicles, and where minor regrading is required.
   2. Provide fertilizer, seed and soil amendments as scheduled and as specified, to provide satisfactory reconditioned lawn. Provide stockpiled or new topsoil to fill low spots to meet new finish grades.
   3. Cultivate bare and compacted areas thoroughly to provide a satisfactory planting bed.
   4. Remove unsatisfactory lawn areas. Do not turn over into soil. Remove topsoil containing foreign materials resulting from Contractor's operations including oil drippings, stone, gravel and other loose building materials.
   5. Water newly planted areas and keep moist until new grass is established. Protect seeding, as required, by spreading straw mulch.

3.03 MISCELLANEOUS LANDSCAPE WORK: INSTALL STEEL EDGING AT LOCATIONS INDICATED. ANCHOR WITH STEEL STAKES SPACED NOT MORE THAN 3' O.C., AND DRIVEN AT LEAST 1" BELOW TOP ELEVATION OF EDGING.

3.04 MAINTENANCE:

A. Maintain lawns for not less than the period stated below, and longer as required to establish an acceptable lawn.
   1. Seeded lawns; not less than 60 days. (If seeded in Fall and not given full 60 days of maintenance, or if not considered acceptable at that time, continue maintenance the following Spring until acceptable lawn is established.)

3.05 TERMINATION OF PLANT AND TURF GUARANTEE PERIOD: AN INSPECTION OF ALL PLANTS AND TURF WILL BE HELD AT END OF GUARANTEE PERIOD. NO ADDITIONAL GUARANTEE WILL BE REQUIRED FOR REPLACEMENT PLANTS. GUARANTEE WILL END ON DATE OF THIS INSPECTION AND INSPECTION WILL BE CONSIDERED FINAL PROVIDED THAT THE FOLLOWING REQUIREMENTS HAVE BEEN MET:

A. Dead, missing and defective plant materials have been replaced as directed by the Architect.

B. Stakes and guys are in good condition.

C. Remedial measures directed by the Architect to ensure plant and turf survival have been carried out.

D. Damage incurred while making plant or turf replacements has been repaired.

3.06 CLEAN UP AND PROTECTION:

A. Keep pavements clean and work area in an orderly condition. Remove excess and waste material daily. Upon completion of planting and sodding in an area, clear area of debris, spoil piles, and containers.

B. Protect landscape work and materials from damage due to landscape operations, operations by other contractors and trades and trespassers. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged landscape work.

END OF SECTION 32 91 20